STATE OF RHODE ISLAND

PUBLIC UTILITIES COMMISSION

IN RE: THE RHODE ISLAND DISTRIBUTED	:	
GENERATION BOARD'S RECOMMENDATIONS	:	
FOR THE 2021 RENEWABLE ENERGY	:	DOCKET NO. 5088
GROWTH PROGRAM YEAR 2021	:	

Recommendations for the 2021 Renewable Energy Growth Program Year

DISTRIBUTED-GENERATION BOARD
& OFFICE OF ENERGY RESOURCES

NOVEMBER 17, 2020

Contents

DISTRIBUTED GENERATION BOARD

2021 RENEWABLE ENERGY GROWTH PROGRAM RECOMMENDATIONS

Background

In accordance with R.I. Gen. Laws § 39-26.6-4(a)(1), the Distributed-Generation Board ("DG Board") hereby submits its recommendations for the 2021 Renewable Energy Growth Program Year ("RE Growth 2021 PY") to the Public Utilities Commission ("Commission" or "PUC"). The recommendations set forth herein, regarding classes, tariff term lengths, ceiling prices, allocation plan, continuation of the existing Carport Solar adder and creation of a new Low Income Community Remote Distributed Generation ("CRDG") adder were approved by the DG Board and endorsed by the Office of Energy Resources ("OER"). In accordance with R.I. Gen. Laws § 39-26.6-4(b), OER, in consultation with the DG Board, engaged Sustainable Energy Advantage, LLC ("SEA") to develop recommended ceiling prices for review and approval by the DG Board and to provide other technical assistance regarding the Renewable Energy Growth ("REG") Program.

Goals and Objectives

The purposes of the REG Program are "to facilitate and promote installation of grid-connected generation of renewable energy; support and encourage development of distributed renewable energy generation systems; reduce environmental impacts; reduce carbon emissions that contribute to climate change by encouraging the siting of renewable energy projects in the load zone of the electric distribution company; diversify the energy generation sources within the load zone of the electric distribution company; stimulate economic development; improve distribution system resilience and reliability within the load zone of the electric distribution company; and reduce distribution system costs." See R.I. Gen. Laws § 39-26.6-1.

Consistent with such purposes, the anticipated outcomes for the RE Growth 2021 PY are the following:

- A diversified renewable energy program with a portion of the megawatt ("MW") capacity allocated to support each sector.
- When appropriate, continued decreases in ceiling prices in certain renewable energy classes.
- Economic development with the State's renewable energy market.
- Maintaining consistent and predictable REG Program and capacity targets from year-to-year for both residential and commercial customer-focused and stand-alone generation renewable energy companies, allowing such companies to operate, maintain staffs and develop complex projects that may have potential multi-year lead times before submitting a proposal to The Narragansett Electric Company d/b/a National Grid ("National Grid").
- The piloting of a performance-based adder for low- and moderate-income customers choosing to subscribe to a CRDG project, as proposed by National Grid, and partially described/discussed herein; and
- The proposed continuation of a performance-based adder for carport projects, on a pilot basis, as proposed by National Grid and partially described herein.

Composition of the DG Board

Please see **Table 1** below for the composition of the DG Board as of the time that the recommendations set forth herein were approved.

Table 1 - DG Board Members

Name	Area of Representation
Nicholas Ucci	OER Commissioner (ex officio, non-voting)
Ian Springsteel	National Grid (ex officio, non-voting)
Annie Ratanasim	Commerce Corporation (ex officio, non-voting)
Jeremy Licht (Chair)	Energy and regulation law
William H. Ferguson (Vice Chair)	Large commercial/industrial users
Samuel J. Bradner	Small commercial/industrial users
Karen A. Stewart	Residential users
Vacant	Low income users
Sheila Dormody	Environmental issues pertaining to energy
Laura C.H. Bartsch	Construction of renewable generation

Renewable Energy Classes

Consistent with R.I. Gen. Laws § 39-26.6-3(15), § 39-26.6-4(a)(1), § 39-26.6-7(b), and § 39-26.6-7(c), please see **Table 2A** below which contains the DG Board's recommendations for renewable energy classes and eligible system sizes for the RE Growth 2021 PY.

The changes between the approved classes for the 2020 PY and the recommended classes for the 2021 PY are illustrated in **Table 2B** below. The specific changes by class are marked in red.

Table 2A - Recommended Renewable Energy Classes 2021 PY

Renewable Energy Class	Eligible System Sizes
Small Solar I	1-15 kW_{DC}
Small Solar II	16-25 kW_{DC}
Medium Solar	26-250 kW_{DC}
Commercial Solar	251-750 kW_{DC}
	751- 999 kW_{DC}
Large Solar	1-5 MW_{DC}
Wind	$\leq$ 5 MW_{AC}
Anaerobic Digestion	$\leq$ 5 MW_{AC}
Small Scale Hydropower	$\leq$ 5 MW_{AC}
Community Remote – Commercial Solar	251-750 kW_{DC}
Community Remote – Commercial Solar	751-999 kW_{DC}
Community Remote – Large Solar	1-5 MW_{DC}
Community Remote – Wind	$\leq$ 5 MW_{AC}

<table>
<tr><th colspan="2">Table 2B – Renewable Energy Classes: Approved 2020 PY vs Recommended 2021 PY</th></tr>
<tr><th>PUC Approved 2020 PY</th><th>DG Board Recommended 2021 PY</th></tr>
<tr><td>Small Solar I
(1-10 kW$_{DC}$)</td><td>Small Solar I
(1-15 kW$_{DC}$)</td></tr>
<tr><td>Small Solar II
(11-25 kW$_{DC}$)</td><td>Small Solar II
(16-25 kW$_{DC}$)</td></tr>
<tr><td>Medium Solar
(26-250 kW$_{DC}$)</td><td>Medium Solar
(26-250 kW$_{DC}$)</td></tr>
<tr><td rowspan="2">Commercial Solar
(251 kW – 999 kW$_{DC}$)</td><td>Commercial Solar
(251 kW–750 kW$_{DC}$)</td></tr>
<tr><td>Commercial Solar
(751 kW–999 kW$_{DC}$)</td></tr>
<tr><td>Large Solar
(1-5 MW$_{DC}$)</td><td>Large Solar
(1-5 MW$_{DC}$)</td></tr>
<tr><td>Wind (≤ 5 MW$_{AC}$)</td><td>Wind (≤ 5 MW$_{AC}$)</td></tr>
<tr><td>Anaerobic Digestion (≤ 5 MW$_{AC}$)</td><td>Anaerobic Digestion (≤ 5 MW$_{AC}$)</td></tr>
<tr><td>Small Scale Hydropower (≤ 5 MW$_{AC}$)</td><td>Small Scale Hydropower (≤ 5 MW$_{AC}$)</td></tr>
<tr><td rowspan="2">Community Remote – Commercial Solar
(251 kW – 999 kW$_{DC}$)</td><td>Community Remote – Commercial Solar
(251-750 kW$_{DC}$)</td></tr>
<tr><td>Community Remote – Commercial Solar
(751–999 kW$_{DC}$)</td></tr>
<tr><td>Community Remote – Large Solar
(1-5 MW$_{DC}$)</td><td>Community Remote – Large Solar
(1-5 MW$_{DC}$)</td></tr>
<tr><td>Community Remote – Wind
(≤ 5 MW$_{AC}$)</td><td>Community Remote – Wind
(≤ 5 MW$_{AC}$)</td></tr>
</table>

Tariff Term Lengths

Consistent with R.I. Gen. Laws § 39-26.6-4(a)(1), please see **Table 3A** below, which contains the DG Board's recommendations for tariff lengths for the RE Growth 2021 PY.

Table 3A – Recommended Tariff Lengths 2021 PY	
Renewable Energy Class	**Tariff Length**
Small Solar I	15 Years
Small Solar II	20 Years
Medium Solar	20 Years
Commercial Solar	20 Years
Large Solar	20 Years
Wind	20 Years
Anaerobic Digestion	20 Years
Small Scale Hydropower	20 Years
Community Remote – Commercial Solar	20 Years
Community Remote – Large Solar	20 Years
Community Remote – Wind	20 Years

Ceiling Prices

Consistent with R.I. Gen. Laws § 39-26.6-5(d) and § 39-26.2-5, please see **Table 4A** below, which contains the DG Board's recommendations for ceiling prices for the RE Growth 2021 PY. The changes between the approved ceiling prices for the 2020 PY and the recommended ceiling prices for the 2021 PY are illustrated in **Table 4B** below. For additional information, please see the pre-filed testimony and schedules of Jim Kennerly, SEA, (Pages 19-38; 39-60).

Ceiling price trends from 2011-2021 are illustrated in **Table 4C** (Solar), **Table 4D** (Wind), **Table 4E** (Anaerobic Digestion), and **Table 4F** (Hydropower) below.

Table 4A - Recommended Ceiling Prices 2021 PY

Renewable Energy Class	Ceiling Price (¢/kWh)
Small Solar I	29.95
Small Solar II	25.85
Medium Solar	22.25
Commercial Solar (251-750 kW)	19.05
Commercial Solar (751-999 kW)	15.75
Large Solar	11.85
Wind	20.05
Anaerobic Digestion	21.15
Small Scale Hydropower	27.35
Community Remote – Commercial Solar (251-750 kW)	21.91
Community Remote – Commercial Solar (751-999 kW)	18.11
Community Remote – Large Solar	13.63
Community Remote – Wind	22.45

Table 4B – Ceiling Prices: Approved 2020 PY vs Recommended 2021 PY			
Renewable Energy Class	**DG Board Recommended 2021 PY**	**PUC Approved 2020 PY**	**% Change between 2020 PY and 2021 PY**
Small Solar I	29.95	29.65	1.0%
Small Solar II	25.85	23.45	10.0%
Medium Solar	22.25	21.15	5.0%
Commercial Solar (251-750 kW)	19.05	18.25	4.0%
Commercial Solar (751-999 kW)	15.75	18.25	-14.0%
Large Solar	11.85	13.65	-13.0%
Wind	20.05	18.85	6.0%
Anaerobic Digestion	21.15	15.35	38.0%
Small Scale Hydropower	27.35	21.45	28.0%
Community Remote – Commercial Solar (251-750 kW)	21.91	20.99	4.0%
Community Remote – Commercial Solar (751-999 kW)	18.11	20.99	-14.0%
Community Remote – Large Solar	13.63	15.70	-13.0%
Community Remote – Wind	22.45	21.05	7.0%

Table 4C - Ceiling Price Trend for Solar

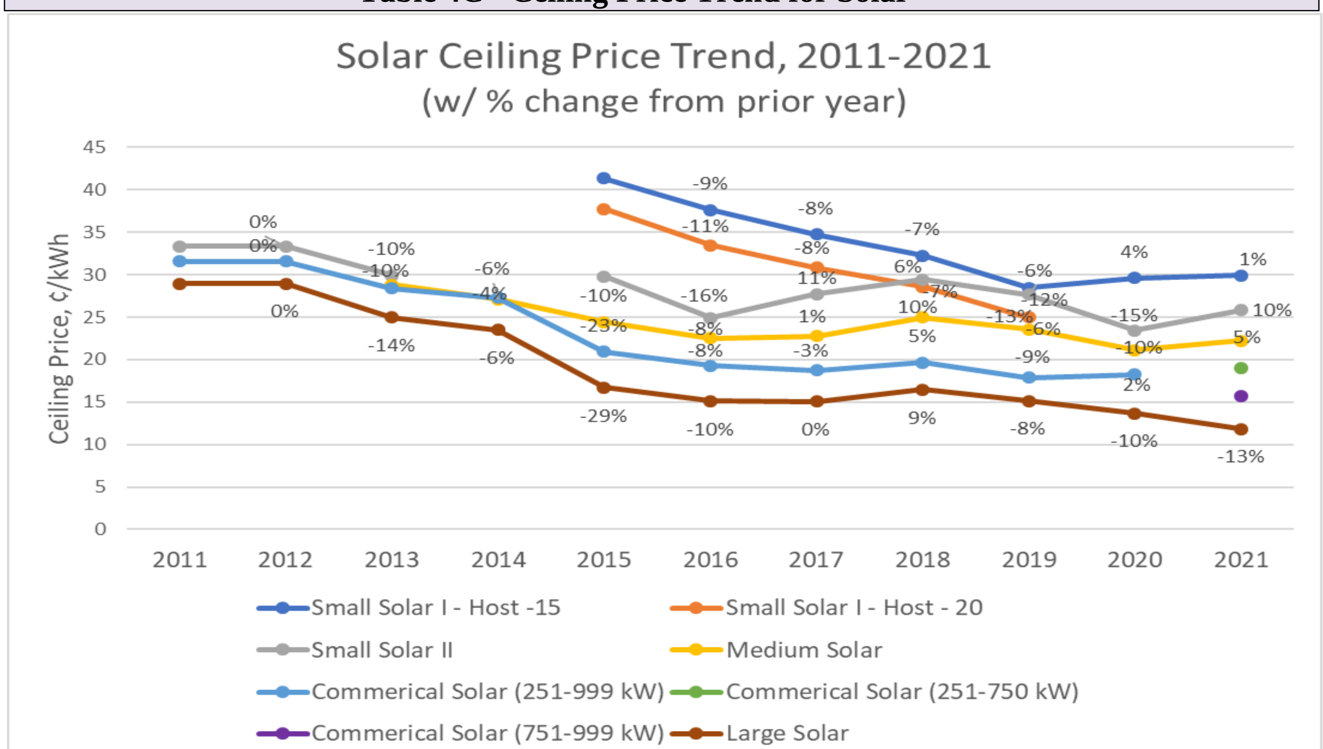


Table 4D - Ceiling Price Trend for Wind

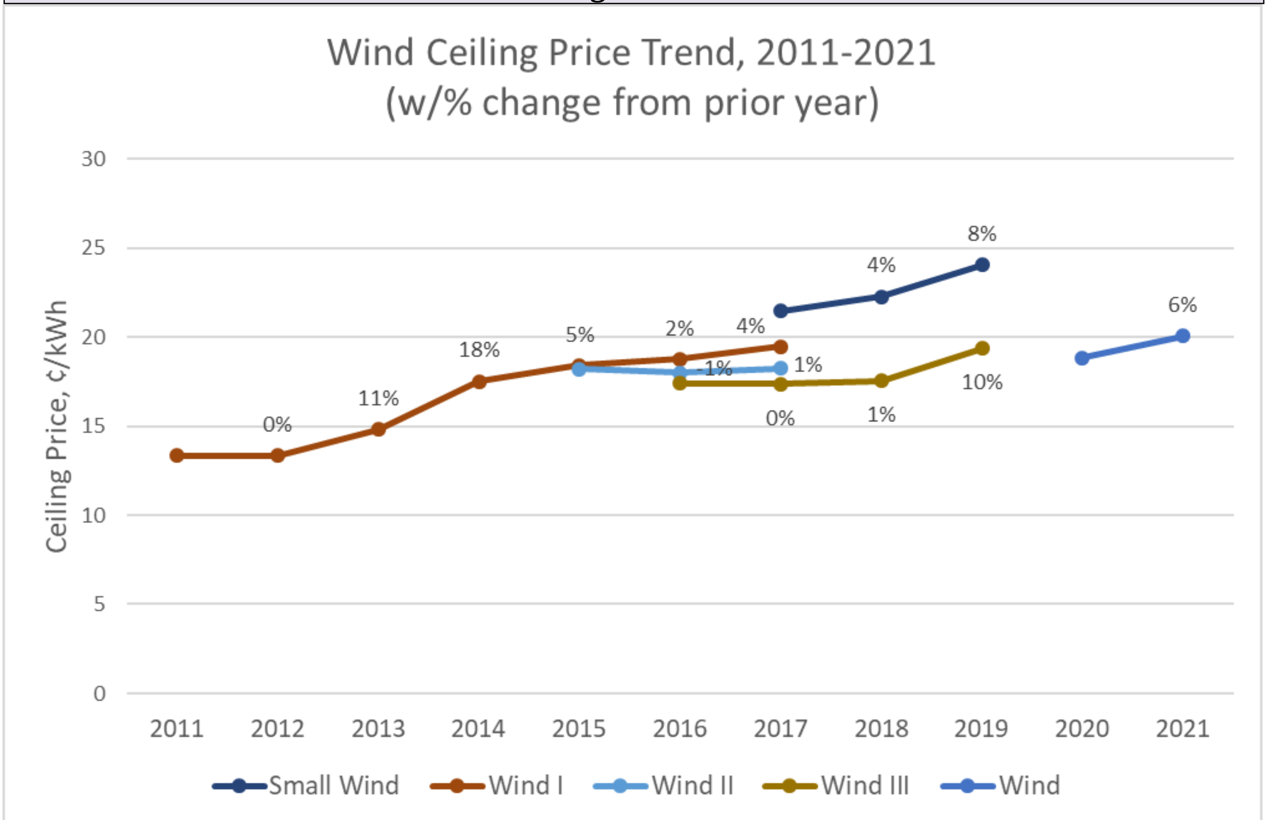


Table 4E - Ceiling Price Trend for Anaerobic Digestion

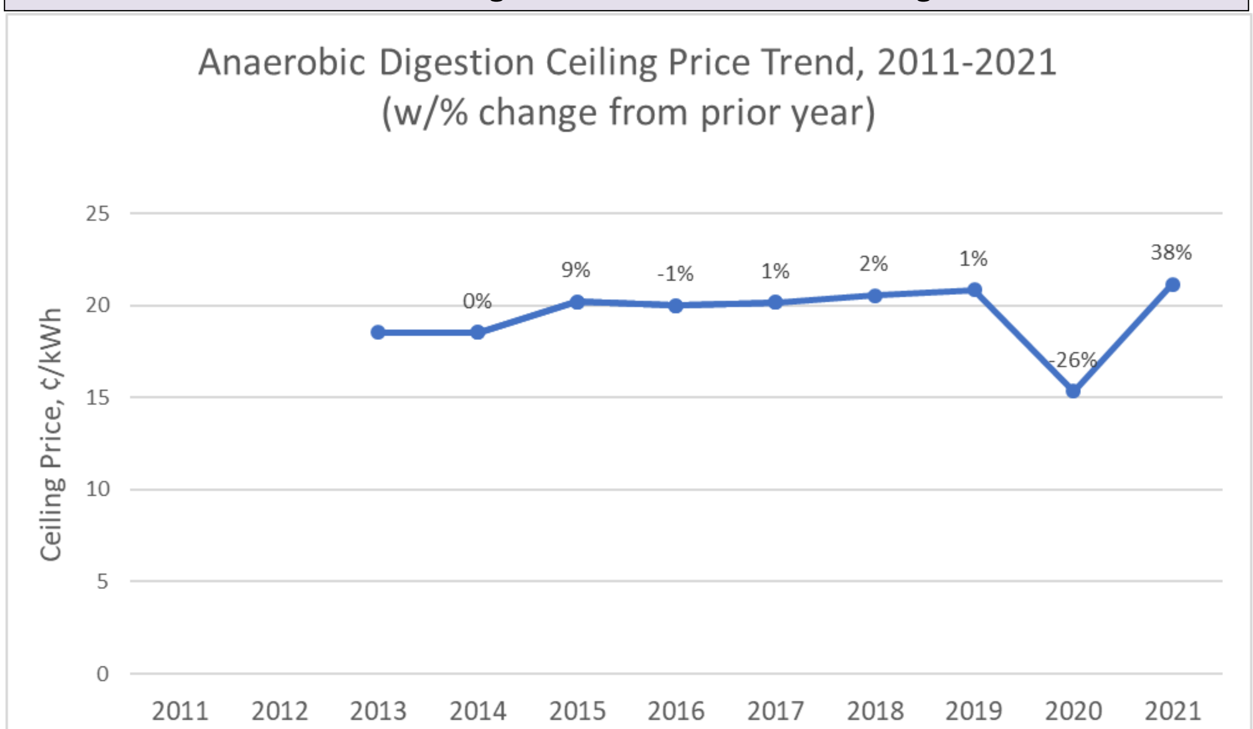
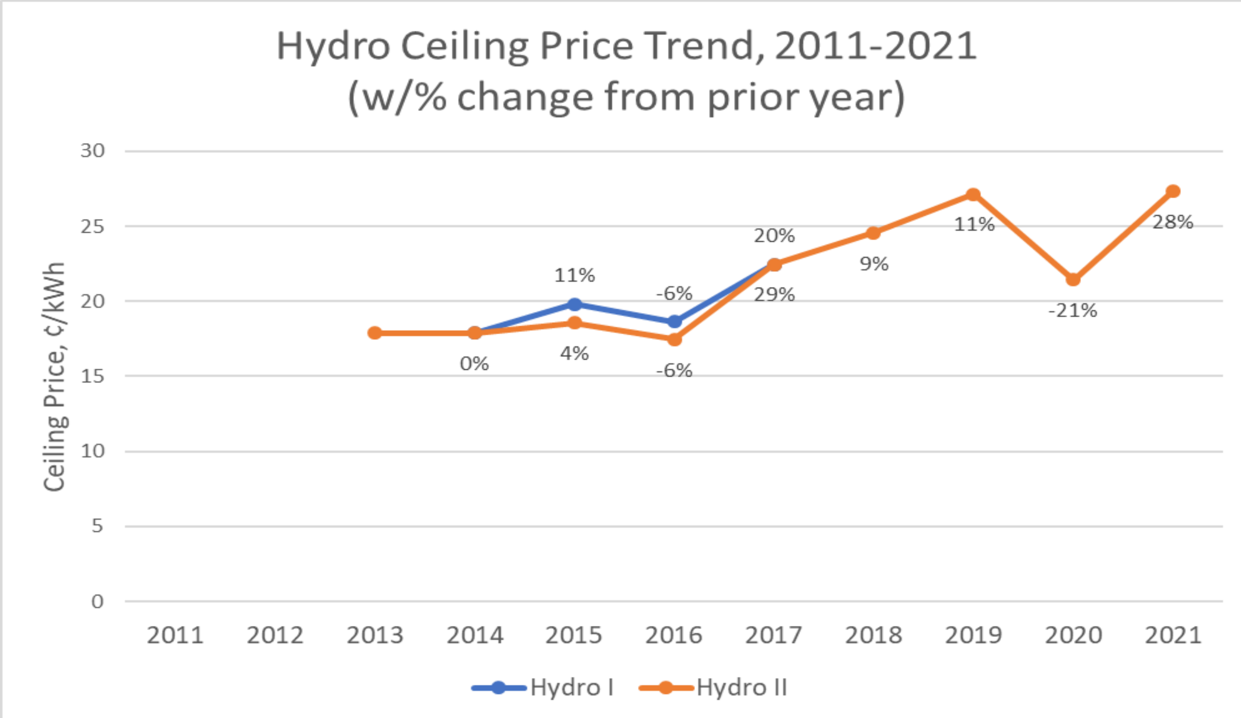


Table 4F - Ceiling Price Trend for Hydropower



Allocation Plan

Consistent with R.I. Gen. Laws § 39-26.6-12(c)(5), please see **Table 5A** below which contains the DG Board's recommended allocation plan for the RE Growth 2021 PY. The changes between the approved allocation plan for the 2020 PY and the recommended allocation plan for the 2021 PY are illustrated in **Table 5B** below. The total megawatt number reflects the annual megawatt capacity (40 megawatts) for the RE Growth 2021 PY in addition to any unused or terminated megawatt capacity (16.847 megawatts as of May 2020) from the RE Growth 2017-2019 PYs.

Table 5C below contains the recommended allocation for the first commercial enrollment for the RE Growth PY 2021.

Table 5A - Recommended Allocation Plan 2021 PY	
Renewable Energy Class	**Allocation in MW**
Small Solar I & II	6.950
Medium Solar	5.0
Commercial Solar	10.0
Large Solar	20.0
Wind	3.0
Community Remote – Wind	
Anaerobic Digestion	1.0
Small Scale Hydropower	
Community Remote – Commercial Solar	5.0
Community Remote – Large Solar	5.897
Total	**56.847**

Table 5B – Allocation Plan: Approved PY 2020 vs Recommended PY 2021			
Renewable Energy Class	**DG Board Recommended PY 2021 (MW)**	**DG Board Recommended and PUC Approved 2020 PY**	**Change between 2020 PY and 2021 PY (%)**
Small Solar I & II	6.950	6.950	0.0%
Medium Solar	5.0	3.0	66.7%
Commercial Solar	10.0	8.244	21.3%
Large Solar	20.0	18.294	9.3%
Wind	3.0	3.0	0.0%
Community Remote – Wind			
Anaerobic Digestion	1.0	1.0	0.0%
Small Scale Hydropower			
Community Remote – Commercial	5.0	3.0	66.7%
Community Remote – Large Solar	5.897	3.0	96.6%
Total	**56.847**	**46.488**	**22.3%**

Table 5C - Recommended Allocation Plan for First Enrollment 2021 PY	
Renewable Energy Class	**Allocation in MW**
Small Solar I & II	6.950*
Medium Solar	5.0**
Commercial Solar	10.0***
Large Solar	20.0****
Wind	3.0
Community Remote – Wind	
Anaerobic Digestion	1.0
Small Scale Hydropower	
Community Remote – Commercial Solar	5.0
Community Remote – Large Solar	5.897
Total	**56.847**

* Any additional megawatt capacity that remains unused from the 2020 RE Growth 2020 PY Small Solar Class (closes on March 31, 2021) would be allocated to the 2021 RE Growth PY Small Solar Class.

**Assuming that the PUC chooses to authorize the continuation of the current Carport Solar adder pilot program into 2021, the DG Board proposes that 1.0 MW will be preserved through the 3rd enrollment, to provide an opportunity for carport project applications to be submitted as part of the Medium Solar Class. The DG Board proposes this step in recognition of the fact that the carport market is relatively new in Rhode Island, developers may need time to develop projects and submit interconnection applications to National Grid, and that local municipalities/planning boards are new to the solar carport subject. This would be a new addition to the continuation of the Carport Pilot Program in 2021.

***Assuming approval of the Carport Solar adder pilot continuation, 2.0 MW will be preserved through the 3rd enrollment to provide an opportunity for carport project applications to be submitted as part of the Commercial Solar class. This is due to the carport market being new in Rhode Island, the market needing time to develop projects and submit interconnection applications to National Grid and local municipal ordinances/planning boards being new to the solar carport subject. This is the same approach used in the 2020 Carport Pilot Program Year.

****Assuming approval of the Carport Solar adder pilot continuation, 4.0 MW will be preserved through the 3rd enrollment, to provide an opportunity for Carport Solar project applications to be submitted into the Large Solar class. This is due to the carport market being new to Rhode Island, the market needing time to develop projects and submit interconnection applications to National Grid and local municipal ordinances/planning boards being new to the solar carport subject. This is the same approach used in the 2020 Carport Pilot Program Year.

The second (August) and third (October) enrollment quantities will be dependent on the results of the first enrollment.

Continuation of Solar Carport Adder Pilot

On February 18, 2020, the PUC approved a 6.0 cent adder for Carport projects on a pilot basis for the 2020 program year. In its Order approving the Carport Adder Pilot, the PUC also directed OER and the DG Board to report on lessons learned from the Pilot, including an assessment of the public policy benefits of the Pilot. OER and the DG Board engaged SEA, together with its subcontractor Mondre Energy ("Mondre"), to produce a report evaluating the Carport Adder. The Consulting Team's (SEA and Mondre) evaluation report collected available information on the costs and benefits of solar carport projects and included a cost-benefit analysis of the Carport Adder.

Four carport projects bid into the 2020 open enrollments, and three of those projects were selected for an award. Two of the selected projects and the one project that was not selected were all in the Commercial Solar Class. The final selected project was in the Large Solar Class.

The Consulting Team collected information on the costs and benefits of carport projects. **Table 6A** presents the range of adder values that correspond to collected cost and production data. In addition, National Grid has proposed a continuation of the Carport Adder Pilot at a level of 5.0 ₵/kWh, which falls within the range of adder outcomes under the cost and production scenarios modeled. **Table 6B** presents the resulting benefit-cost ratios (assuming a 7% discount rate) from a 5.0 ₵/kWh adder.

Table 6A – Modeled Cost-Based Carport Adder Values	
Cost and Production Case	**₵/kWh**
Low OpEx Costs, High Production (14.6% CF)	4.9
Low OpEx Costs, Low Production (13.1% CF)	7.0
Mean OpEx Costs, High Production (14.6% CF)	5.6
Mean OpEx Costs, Low Production (13.1% CF)	7.7

Table 6B – Benefit-Cost Ratios with 5.0 ₵/kWh Carport Adder		
Case	**Commercial Solar**	**Large Solar**
Low Benefits, Low Costs	1.08	0.65
High Benefits, Low Costs	3.66	1.07
Low Benefits, High Costs	0.97	0.58
High Benefits, High Costs	3.28	0.96

Given the small number of projects and limited data, the DG Board recommends an extension of the Carport Adder Pilot at a 5.0 ₵/kWh level during the 2021 PY in order to collect more data on carport costs, benefits and REG bidding behavior with the presence of a Carport Adder. The research to evaluate the 2020 carport adder indicates that there are clear and quantifiable public benefits of carport projects, particularly as relates to siting solar on previously developed sites rather than greenfields and that carport projects are not likely to be pursued without an adder or higher incentive level. Continuation of the pilot for an additional year will provide the opportunity to evaluate a larger number of carport projects participating in the program and also give the market more time to respond to the presence of the carport adder.

For additional information on the proposal to continue the solar carport adder pilot program, please see the pre-filed direct testimony of Kate Daniel (Pages 61-70); Schedules 1 & 2 (Pages 71,72).

Proposed Low-Income CRDG Adder

During the same February 18, 2020 meeting at which it approved the initial Carport Solar pilot program, the PUC also requested that National Grid, OER, the DG Board and SEA collaborate to consider and develop additional "public policy adders". The PUC further directed National Grid to carry the burden of proof for proposing such public policy adders if agreed upon by the above-mentioned group of stakeholders and directed that National Grid must receive substantial input from SEA as part of that process. Following the PUC's direction, OER and the DG Board directed SEA to engage with Rhode Island renewable energy stakeholders to determine appropriate public policy adder values.

As a result of that process, the DG Board recommends that the PUC adopt a Low-Income CRDG Adder proposed by National Grid. The adder would, if approved by the PUC, be set at 3.0 ₵/kWh and be open to either roof- or ground-mounted projects that maintain a minimum 20% subscription rate from National Grid A-60 customers. OER and the DG Board believe that approval of this adder would be a critical and cost-effective step towards sharing the financial benefits of solar PV technology with all of the people of Rhode Island, regardless of income level.

Conclusion

After an extensive and transparent development process, the DG Board voted at its October 26, 2020 meeting to approve the recommendations set forth herein. The DG Board and OER respectfully request the PUC to approve such recommendations for the RE Growth 2021 PY.

Pre-Filed Direct Testimony of Jim Kennerly – Sustainable Energy Advantage

I, Jim Kennerly, hereby testify under oath as follows:

1. **Please state your name, employer and title.**
   My name is Jim Kennerly. I am employed as a Senior Consultant by Sustainable Energy Advantage, LLC ("SEA").

2. **Can you please provide your background related to renewable energy technologies?**
   I have over ten years of experience with climate and energy policy and its impact on markets for clean energy technologies. I have nine years of professional experience directly related to renewable energy market and policy development. At SEA, I lead the company's public policy analytics and serve as a subject matter expert regarding distributed energy resource markets and policies.

   In addition to the Rhode Island Office of Energy Resources ("OER") and Distributed Generation Board ("DG Board"), our distributed energy team has undertaken custom consulting work for the Massachusetts Department of Energy Resources ("MA DOER"), the New Jersey Board of Public Utilities ("NJ BPU"), the Massachusetts Clean Energy Center, the New York State Energy Research and Development Authority ("NYSERDA"), the New Hampshire Office of Consumer Advocate, the Massachusetts Attorney General's Office, the Connecticut Green Bank, the Clean Energy States Alliance, Vote Solar, the Natural Resources Council of Maine and a wide variety of buy-side and sell-side solar and distributed energy market participants.

   Prior to working at SEA, I was a Senior Policy Analyst at the North Carolina Clean Energy Technology Center ("NCCETC") at North Carolina State University, where I served as the senior analyst for the energy policy team, which manages the Database of State Incentives for Renewables and Efficiency ("DSIRE"), and where I led the NCCETC's participation in a national technical assistance and research grant for the United States Department of Energy's SunShot Initiative. Prior to that, I was a Regulatory and Policy Analyst at the North Carolina Sustainable Energy Association, where I managed the organization's regulatory, legislative and utility rates analysis.

   I have a Master of Public Affairs degree from the Lyndon B. Johnson School of Public Affairs at the University of Texas at Austin and a Bachelor of Arts in Politics from Oberlin College.

3. **Can you please provide SEA's background related to renewable energy technologies?**
   SEA is a consulting advisory firm that has been a national leader on renewable energy policy analysis, market analysis and program design for over 20 years. In that time, SEA has supported the decision-making of more than two hundred (200) clients, including more than forty (40) governmental entities, through the analysis of renewable energy policy, strategy, finance, projects and markets. SEA is known and respected widely as an independent analyst, a reputation earned through the firm's ability to identify and assess all stakeholder perspectives, conduct analysis that is objective and valuable to all affected and provide advice and recommendations that are in touch with market realities and dynamics.

4. What role has SEA played in the development of the Renewable Energy Growth (REG) program?

Since 2011, SEA has served as a technical consultant to OER and, beginning in 2014, to the DG Board in their implementation of the Distributed-Generation Standard Contracts Program ("DG Program"), R.I. Gen. Laws § 39-26.2-1 et seq., and the Renewable Energy Growth Program ("REG Program"), R.I. Gen. Laws § 39-26.6-1 et seq. SEA's role is to advise OER and the DG Board to make informed recommendations with respect to technology- and size-specific ceiling prices based on detailed research and analysis.

5. What was SEA's role in the development of the 2021 REG program?

SEA was hired by OER and the DG Board to conduct detailed research and analysis of regional distributed renewable energy markets, collect additional insight through public meetings, written comments and interviews, and then to recommend ceiling prices for each technology-, ownership- and size-specific class established by OER and the DG Board. In addition, SEA also managed a stakeholder process in conjunction with OER and National Grid to explore and develop potential Public Policy Adders for proposal as potential pilot programs by National Grid to this Commission.

Overview of Ceiling Price Development Process

6. Please describe the process that SEA utilizes to develop recommended ceiling prices.

Each year, SEA acts as a joint facilitator of a lengthy process to request, gather and analyze cost and performance data from current and prospective market participants and other interested parties. Throughout the process, SEA solicits empirical evidence from stakeholders regarding market trends and practices and offers multiple opportunities for interested parties to participate in public meetings and submit written comments, which are encouraged to address both general market observations and to respond directly to specific data requests and draft proposed ceiling price recommendations. SEA also conducts interviews with active market participants each year. SEA incorporates all the intelligence gained from this market research into its modeling of Ceiling Prices, utilizing the National Renewable Energy Laboratory ("NREL") Cost of Renewable Energy Spreadsheet Tool ("CREST") model to generate recommended ceiling prices through multiple rounds of analysis. The process included three presentations to the DG Board and stakeholders. At the final presentation, the DG Board discussed and approved the recommendations proposed by SEA which are reflected in the Report.

7. When were the presentations made to the DG Board and stakeholders?

SEA's first presentation was at a public meeting held by webinar on July 28, 2020, during which it presented the first draft of proposed ceiling price inputs and results for all technology categories. SEA presented the second draft of proposed inputs and results at a stakeholder meeting held by webinar on September 8, 2020. The final ceiling price recommendations for all technology categories were presented at a DG Board public meeting held by webinar on October 26, 2020.

8. Are those presentations attached to the Report and Recommendation?

Yes.

Cost of Renewable Energy Spreadsheet Tool ("CREST")

9. Can you please explain the Cost of Renewable Energy Spreadsheet Tool ("CREST") model?

Yes. The CREST model is a discounted cash flow analysis tool published by the National Renewable Energy Laboratory (NREL). SEA was the primary architect of the CREST model, which was developed under contract to NREL. The CREST model is available to the public without charge, and is fully transparent (that is, all formulas are visible to, and traceable by, all users). CREST was created to help policymakers develop cost-based renewable energy incentives and has been peer reviewed by both public and private sector market participants. The model is designed to calculate the cost of energy, or minimum revenue per unit of production, necessary for the modeled project to cover its expenses, service its debt obligations (if any), and meet its equity investors' assumed minimum required after-tax rate of return.[1] CREST was developed in Microsoft Excel, so it offers the user a high degree of flexibility and transparency, including full comprehension of the underlying equations and model logic. Beginning in 2015, NREL re-released CREST models that allow the user to edit formulas, without limit.

10. Were the CREST models made available to stakeholders?

Yes. The CREST models are always available to the public. Any stakeholder may download a CREST model from NREL's website, without charge, and enter any number of different input configurations.

In addition, on September 18, 2020, SEA released a custom (and simplified) version of the CREST model, as well as sample inputs included in an earlier draft of the analysis, via email to its list of Renewable Energy Growth Program stakeholders. Relative to the CREST model SEA designed for NREL, the simplified version released to stakeholders includes several adjustments specific to Rhode Island (including, but not limited to, the way in which state and federal tax benefits are calculated). We enclose this public version of the model, as customized for the REG work, as **JK Schedule 1**.

11. Were the Public Utilities Commission ("PUC") and Division of Public Utilities and Carriers ("DPUC") staff and consultants included on the communication to stakeholders that included the customized CREST model?

Yes.

12. Do you wish to make any changes to the model as provided to stakeholders at this time?

No, not to the core structure or calculations of the model. The inputs included in the model provided to stakeholders on September 18 via email can be substituted for the ones provided in the final October 26, 2020 consulting team presentation to the DG Board.

<u>Ceiling Price Development – Stakeholder Engagement Process</u>

13. How many stakeholder comments were received in response to the formal data requests?

The number of responses to both the data request and survey, including those obtained via interviews and follow-ups, are summarized in **JK Schedule 2** below. SEA successfully followed up with stakeholders

[1] CREST calculates this after-tax rate of return on a "levered" basis, which means that the return on equity capital invested is a percentage that is intended to reflect a return net of assumed debt service payments.

with two separate but simultaneous requests (one related to financing terms and another related to other cost and performance issues), which were closed following the second stakeholder meeting (described above). However, SEA made clear that stakeholders were free to offer formal and informal comments throughout the process.

Copies of all the survey instruments can be found in **JK Schedules 3-5**).

14. Please summarize the subject matter on which stakeholders commented. How were these comments incorporated into the process and ceiling price recommendations to the DG Board?

SEA received comments regarding three of the four eligible technologies (solar, wind, hydroelectric) from a combination of project developers, financiers, and the DPUC. As during the 2020 process, however, SEA received no feedback from Anaerobic Digestion stakeholders. Throughout the process, SEA vetted all the stakeholder feedback and made more than a dozen adjustments to inputs or calculation methodologies as a direct result of stakeholder feedback. For summaries of comments provided by stakeholders and how SEA responded to them, please see **JK Schedule 6**, a consolidated set of SEA's stakeholder presentations delivered as part of the ceiling price development process.

15. Are ceiling price recommendations based exclusively on stakeholder input?

No. While stakeholder input is critical to understanding aspects of the project cost, financing and market landscape specific to Rhode Island, basing all aspects of the proposed ceiling prices on the self-reported assumptions of the entities seeking tariff compensation, particularly if inputs and comments are received from a limited number of project developers in a given technology or size category, would be difficult to justify, and would risk over-compensating project owners at the expense of ratepayers. Thus, the 2020 recommended ceiling prices take other recent data sources into account, particularly with respect to cost and financing trends, to incentivize the development of projects in Rhode Island that are price-competitive with similar projects throughout the region.

16. Did the DG Board allow SEA to have direct communication with the stakeholders on the development of the ceiling prices, including by email, phone calls and face to face meetings?

Yes. OER and the DG Board encouraged stakeholders to ask questions of SEA directly by phone, email or in person. As a result, SEA attended stakeholder meetings, conducted phone calls and exchanged emails with a range of participants on a range of topics.

17. Did SEA, on behalf of the DG Board, consider all the stakeholder feedback given in the development of recommended 2020 ceiling prices?

Yes. While we did not adopt every stakeholder suggestion, we solicited, carefully considered, and incorporated stakeholder feedback throughout the entire process. SEA's presentation of multiple draft ceiling prices, and associated explanation of changes in response to stakeholder feedback (which can be found attached to the Report and Recommendations), substantiates this consideration.

18. Did SEA engage with the DPUC and their consultants during the development of the ceiling prices, and related assumptions?

Yes. The consulting team collaborated extensively with consultants to the DPUC and directly incorporated a significant number of their suggested changes to the ceiling price inputs.

19. Are those recommendations reflected in the Report and Recommendation submitted to the Commission?
Yes.

20. Were there any SEA recommendations that were not included in the Report?
No.

<u>**Ceiling Price Development – Proposed Ceiling Prices, Renewable Energy Classes and Eligible System Sizes**</u>

21. Can you verify the renewable energy classes included in the Report and Recommendations, and provide a comparison of the renewable energy classes and corresponding eligible system sizes approved by the PUC for the 2020 program year with those proposed by OER and the DG Board for the 2021 program year?
OER and the DG Board's proposed renewable energy classes and corresponding eligible system sizes can be found in **JK Schedule 7**. **JK Schedule 8** compares the 2020 approved classes and eligible size ranges with the ones proposed for the 2021 program year.

22. Can you verify the 2021 ceiling prices included in the Report and Recommendations?
Yes. The recommended ceiling prices, tariff terms and eligible system sizes for each renewable energy class are summarized in **JK Schedule 9**.

23. Are these the same ceiling prices that were developed through the CREST modeling in conjunction with stakeholders and OER, and recommended to the DG Board?
Yes.

24. Do the proposed 2021 ceiling prices differ from the 2020 ceiling prices? If yes, please quantify the percentage change for each category.
Yes. The percentage change between the proposed 2021 ceiling prices and the final 2020 ceiling prices can be seen in **JK Schedule 10** below.

<u>**Ceiling Price Development – Changes from 2020 Approved Solar Prices/Key Drivers of Change**</u>

25. Please describe the most impactful drivers of changes in the proposed ceiling prices for the Solar categories relative to those approved for the 2021 Program Year.
Like the 2020 approved ceiling prices, the proposed 2021 ceiling prices reflect a mix of changes that place upward and downward pressure on costs and prices. I describe this mix of drivers of downward and upward pressure on the proposed ceiling prices below.

<u>Drivers of Downward Pressure on Proposed 2021 Solar Ceiling Prices</u>

- *Region-Wide Installed Cost Reductions and 2020 1st Open Enrollment Results for Solar Projects Greater Than or Equal To 25 kW*: Our main sources for Solar project installed costs (the most significant driver of Solar project ceiling prices) for Small Solar I and II, Medium and Large Solar are:
    - Installed cost estimates associated with bids submitted into the First Open Enrollment of the 2020 Program Year (obtained confidentially from National Grid, who obtains them from project developers); and
    - Publicly-available installed cost data from Rhode Island and other Northeastern states.

  JK Schedule 11 below compares the final assumed installed costs for the 2020 approved and 2021 proposed ceiling prices for Small Solar I and II, Medium and Large Solar.[2]

- *Proposed Separate Ceiling Price for Commercial Solar 751-999 kW_{DC}:* When utilizing a 900 kW_{DC} proxy project for modeling a separate ceiling price for 751-999 kW_{DC} projects (rather than a 500 kW_{DC} proxy project), assuming a lower capital cost and higher production volume (resulting from the larger proxy size) results in a substantially lower ceiling price than proposed for the Commercial Solar class for the 2020 program year.
- *Increases in Assumed Production for Medium and Commercial Solar Projects:* As part of the ceiling price development process and data requests, SEA received a database of capacity factors from a portfolio of distributed solar projects under development in Rhode Island. These projects indicated that the values assumed for Medium and Commercial Solar projects for the 2020 program year likely understated the amount of production that could be expected from projects sized from 26-250 kW_{DC} and 251-999 kW_{DC}. As a result, SEA adjusted these values upwards from 14.0% to 14.6% for Medium Solar projects, and from 14.0% to 14.8% for Commercial Solar (whether such projects fall into the 251-750 kW_{DC} or the 751-999 kW_{DC} ranges).
- *Impacts of COVID-19 Pandemic on Interest Rates for Term Debt:* The COVID-19 pandemic has led to an unprecedented degree of quantitative easing that has led to reductions in the cost of debt for larger distributed-scale projects with third-party sponsors. The Federal Open Markets Committee of the Federal Reserve Bank of the United States has cut the Federal Funds rate to near-zero levels (targeting 25 basis points) since the 2020 program year filing. This new round of easing has driven the cost of debt for projects downwards (notwithstanding some offset by banks assessing added risk premia during the ongoing economic downturn). As a result, our assumption of interest rates on term debt for larger and more well-capitalized borrowers (particularly those that can leverage the balance sheets of larger parent companies) has dropped. SEA assumes that most of the benefits of this drop in the cost of debt accrue to Commercial and Large Solar projects, which are somewhat less likely to be owned by a host customer.
- *Increased Debt Share of Capital Stack for Medium Solar Projects*: With the reduction in the ITC, we have historically assumed that project developers, to mitigate financing costs, will increase the share of debt in the capital stack (which has a lower financing cost than either tax or sponsor equity) by 5%. This results in an equal reduction in the combined share of sponsor and tax equity

[2] The proposed 2020 installed cost values for Community Remote Commercial and Large Solar projects are $150/kW higher than for Commercial and Large Solar.

in the capital stack. Based on discussions with stakeholders and financiers, I believe this is a reasonable assumption, given the fixed, bundled nature of the purchase of energy, capacity and RECs provided by National Grid in exchange for a project's as-bid tariff rate and the fact that the cost of borrowing appears likely to fall further during 2020.

- *Year-on-Year Decline Rates:* After analyzing NREL's 2020 updates to forecasted installed cost decline rates, the Solar categories all include 2020 to 2021 installed cost decline rates, which SEA found to be consistent with the values already assumed in the 2020 ceiling prices (ranging from 3.5% for Small Solar I and II and 4.5% for Solar projects greater than 25 kW_{DC}).

Drivers of Upward Pressure on Proposed 2021 Solar Ceiling Prices

- *Federal Investment Tax Credit (ITC) Step-Down:* The main factor placing across-the-board upward pressure on our proposed 2020 ceiling prices for Solar projects is the step-down in the solar ITC for individual and business taxpayers from 26% to 22% on January 1, 2021. This change affects all Solar projects, and (as shown in **JK Schedule 12** below) increases all Solar ceiling prices by about 4%-6% relative to what the values would have been if the ITC had maintained its 26% value for 2020.
- *Proposed Separate Ceiling Price for Commercial Solar 251-750 kW_{DC}:* While the creation of a 751-999 kW_{DC} ceiling price within the Commercial class reduces costs substantially for such projects, allowing projects smaller than 750 kW_{DC} to bid in under a price more appropriate to their economics results in a slightly higher price for said projects in the 2021 program year than in the 2020 program year. However, given that most of the bids in the Commercial class tend to come from projects larger than 751-999 kW_{DC} (and the Board has not proposed holding aside capacity specifically for projects 251-750 kW_{DC}), it is unlikely that splitting the price offered to projects at different size breaks will cause ratepayers to incur a significant additional cost relative to the status quo (and may actually reduce overall ratepayer costs, based on which projects bid into the 2021 Open Enrollments).
- *Slight Reduction in Assumed Production from Large Solar Projects:* While the database of projects supplied by the aforementioned stakeholder with a portfolio of projects in development in Rhode Island suggested that our previously-assumed capacity factors understated Medium and Commercial Solar production, the same database suggested our production estimates for Large projects were very slightly overstated relative to real-world projects currently in development.
- *Impacts of COVID-19 Pandemic on Sponsor and Tax Equity:* While the pandemic has led to lower cost of debt for larger distributed-scale projects (as described above), it has also increased the cost of sponsor and tax equity, which respond to very different market signals. Overall, it is our assessment that sponsors' return targets (particular for Medium Solar projects and smaller) are likely to increase as potential host customer owners will require higher returns to justify the risk of undertaking any major capital investment during an ongoing economic downturn of uncertain duration. Similarly, the cost and availability of tax equity is tied to the amount of taxable income for a limited set of very large corporate taxpayers. Based on our ongoing assessments of the tax equity market, SEA believes that less tax equity is expected to be available for 2021 deals than was available for tax year 2020, which leads to slightly higher rates for tax equity.

- *Shares of Sponsor and Tax Equity Within Equity Capital Stack:* In addition, a major regional debt and equity market participant indicated that our initially-assumed share of tax equity in the capital stack (75% of total equity capital) was higher than was typical in deals occurring at present and indicated that 60% was more realistic. Given that this financier was active in financing larger deal portfolios and did not have any capital specifically at stake in Rhode Island, we found their suggestions credible enough to include in our assumed tax equity/sponsor equity splits.
- *No Increase in Debt in Capital Stack for Commercial and Large Solar:* SEA also declined to increase the share of debt in the capital stack for non-Medium Solar projects, as we had initially expected to. This is in significant part due to SEA's deeper research into typical debt service coverage ratio, which we had initially assumed could more safely drop below an average of 1.25 than market participants ultimately indicated.
- *Small Solar I and II-Specific Financing Assumption Changes:* Following a survey of Small Solar I and II market participants to update our understanding of changes in financing terms, SEA found that (in contrast with the project finance market) the cost of debt for homeowners had risen. We also received survey responses that provided an updated assessment of the share of small solar systems financed by home equity loans, lines of credit, solar-specific loans, and cash, and adjusted the assumed capital stack for both Small Solar I and II to reflect the market shares of funding sources. Overall, these results are relatively consistent with solar PV is becoming a more attractive proposition for homeowners and businesses of more variable income and credit risk profiles.

For a full list of changes considered and undertaken for the proposed 2021 prices, please see the SEA presentations attached to the Report and Recommendations.

26. Do you believe that the Ceiling Prices for Solar projects reflect the effects of competition and cost reduction?

Yes. As shown in **JK Schedule 13**, relative to the 2020 approved prices for Solar projects, reducing the ITC percentage from 26% to 22% increases Ceiling Prices by approximately 4%-6%, which suggests something close to a linear relationship between the tax credit and ceiling prices. However, when accounting for the factors putting downward pressure on ceiling prices, the proposed 2021 prices, at the very least, do not exceed the assumed increase in Ceiling Prices attributable to the step-down, and at best (in the case of Commercial Solar 751-999 kW_{DC} and Large Solar) include price reductions of 18% in the absence of the step-down.

27. Why did the proposed prices for Small Solar II and Medium Solar rise, even when adjusted to account for the ITC phase-down from 26% to 22%? Please explain your rationale for recommending prices that would exceed the impacts specific to the phase-down of the ITC.

We recommend the adoption of the 2021 prices for Small Solar II and Medium Solar as proposed for two reasons:

- *COVID-19 Pandemic Impact on Small/Medium Business Confidence and Certainty:* As described in my previous answers, the pandemic has (as of this writing) led to a sharp contraction in both economic activity and business certainty and confidence that is likely to last into the 2021 program year and potentially beyond. Based on discussions with REG stakeholders, this is especially true for small and medium-sized businesses that are by far the most likely to host and own Small Solar II and Medium Solar projects on their premises. Thus, to account for the expected increases in corporate hurdle rates for approving new investments that we expect during a time of economic dislocation, we have increased the modeled sponsor equity returns for Medium Solar from 11% to 13.5% and increased assumed Small Solar II sponsor returns from 9.5% to 13%. We believe that in the absence of such an adjustment, these sectors may have an exceedingly difficult 2021 program year.

- *Emerging Evidence of Compensation Challenges for Medium Solar Projects Following Introduction of Competitive Bidding:* For the first time during the ceiling price process, SEA has requested and received project-by-project status data from National Grid. Based on the data the company provided to SEA, it appears that an unusually large number of Medium Solar projects selected during the 1st Open Enrollments of the past several program years have since been terminated, with a significant spike in 2019 after the introduction of competitive bidding in that class. While the precise reasons why any REG project is ultimately terminated may not always be known to OER, the DG Board or National Grid, it is also possible to discern that these terminations occurred in the first year following the introduction of competitive bidding in the Medium Solar class. Based on Medium Solar accepted bid prices, SEA does not believe that this is a coincidence. While SEA does not presently recommend a return of Medium Solar projects to receiving compensation on an administratively-set basis without further evidence, we believe that the disproportionate number of Medium Solar terminations suggest that OER, the DG Board, National Grid, the PUC and the DPUC should pay special attention to ensuring a sufficiently high ceiling price is available to developers in the Medium Solar class to avoid "race-to-the-bottom" conditions that can lead to painful and unnecessary sunk costs and losses for developers, who could (as many have in Connecticut's Low/Zero Emission Credit (LREC/ZREC) programs, where cancellations have historically been relatively high) choose to de-emphasize REG participation.

Given that the Small and Medium Solar segments are specifically required to offer capacity allocation to eligible participants under R.I.G.L. § 39-26.6-7(b)(3), it appears to be the clear intent of the General Assembly to provide sufficient compensation for such projects to reach commercial operation, cover their costs and provide reasonable, market-rate returns to eligible projects. Thus, and considering the larger-than-typical number of cancellations, we have declined to recommend as aggressive adjustments to the prices in these categories as would be typical.

28. Please describe the adjustments the DG Board made to the Commercial Solar ceiling prices and eligible system sizes proposed for the 2021 program year.

During an August 13, 2020 technical session in Docket 4604, Chairman Gerwatowski expressed concern that projects at the lower end of the Large Solar size range could install a slightly smaller kW capacity, enabling the project to bid into an Open Enrollment under the Commercial Solar class, providing access to a ceiling price that is typically several cents/kWh higher than the price for Large Solar. Given these concerns, Chairman Gerwatowski requested that OER and the Board consider options to adjust Commercial Solar pricing to address this concern.

As a general matter, bidders in a competitive procurement with defined size categories will take advantage of the scale economies of solar PV (including distributed solar PV) by bidding at or near the top of any given eligible size range. However, in an effort to mitigate the degree of potential incentive to cluster at the top end of the eligible size range, OER and the Board requested that SEA develop the following two potential options for Commercial Solar pricing for vetting with stakeholders:

- *Option A (Status Quo):* Under this option, the Commercial Solar class would maintain the same 251-999 kW_{DC} eligible system size range (and modeled based on the same 500 kW_{DC} proxy system size) as utilized for the 2020 program year.
- *Option B (Subdivision of Commercial Solar Class):* Under this option, Commercial Solar prices would differ for projects between 251-750 kW_{DC} (with a 500 kW_{DC} modeled system size) and for projects 751-999 kW_{DC} (with a modeled proxy size of 900 kW_{DC}).

These two options were developed, modeled, and shared with stakeholders during the 2021 ceiling price development process. The results of the ceiling price modeling for both options were discussed in SEA's presentations to stakeholders and the DG Board linked in the Report and Recommendations. As also shown in the linked presentations, most stakeholders supported (or, at minimum, did not object to) adopting *Option B*. Thus, OER and the Board directed SEA to utilize *Option B* for developing final recommended ceiling prices for the Commission's consideration and approval.

29. Does the subdivision of Commercial Solar prices into separate tranches for 251-750 kW and 751-999 kW accomplish the goal of reducing the gap between expected compensation for the Commercial and Large Solar classes?

Yes. As shown in **JK Schedule 13**, under *Option B*, the gap between the largest Commercial ceiling price and the Large Solar ceiling price is 1.9 ₵/kWh lower than under *Option A*.

30. Please also describe the adjustments the DG Board made to the Small Solar eligible system sizes proposed for the 2021 program year.

OER and the DG Board recommend that the PUC adopt changes to the eligible system size ranges for Small Solar I and II from 1-10 kW and 11-25 kW to 1-15 kW and 16-25 kW, respectively.

<u>Ceiling Price Development – Changes from 2020 Approved Wind, Hydro and Anaerobic Digestion Prices</u>

31. Please describe the most impactful drivers of changes in the proposed Ceiling Prices for the Wind classes.

The primary driver for the change in the proposed price for Wind is the scheduled expiration of the federal Production Tax Credit ("PTC") on January 1, 2021. As a result, wind project developers nationwide will no longer be able to benefit from the Investment Tax Credit ("ITC") in lieu of the PTC. SEA also assumed a slight (2.5%) increase in the share of debt in the Wind capital stack, a slight (50 basis point) increase in assumed interest rates on debt, as well as a slight (50 basis point) increase in the assumed sponsor equity return, since our analysis showed that Wind projects could still cover their debt service payments with a slight increase to the amount of debt in the capital stack.

32. Please describe SEA's assumptions regarding federal and state tax benefits for Wind projects relative to the 2020 final prices.

While the proxy Wind and Wind CRDG projects both assume the expiration of the PTC at the end of 2020 (as slated to occur under current law), our approach to accounting for the uneven availability to claim bonus depreciation for the 2021 proposed ceiling prices is unchanged from the approach (averaging a version of the Wind (and Wind CRDG) price assuming the Internal Revenue Service's (IRS') 5-year Modified Accelerated Cost Recovery System (MACRS) depreciation with a Wind (and Wind CRDG) price assuming election of 100% bonus depreciation provisions proposed in Docket 4983 and approved by the Commission.

33. Please describe the most impactful driver of changes in the proposed Ceiling Prices for the Anaerobic Digestion ("AD") and Small-Scale Hydropower ("Hydro") categories.

The main change in the assumptions utilized for Hydro and AD projects involved the reduction of the ITC in lieu of the PTC from 30% to 0%. Without the ability to monetize this credit, we find that the prices for these resources increase by 28% and 38%, respectively. In addition, SEA also increased the assumed value for the cost of insuring Hydro projects.

<u>Community Remote Distributed Generation (CRDG)</u>

34. Under Rhode Island law, is there a limit on the total amount of CRDG incremental cost that can be utilized when calculating ceiling prices for CRDG projects?

Yes. Per Rhode Island Gen. Laws § 39-26.6-27(e)(2), the ceiling price for a CRDG project cannot be more than 15% higher than the ceiling price for a non-CRDG project within the same size range in effect at any given time.

35. What are the components of incremental Community Remote Distributed Generation ("CRDG") costs utilized to determine the incremental cost of developing a CRDG project, and what activities cause such projects to incur these costs?

The two main incremental cost components that comprise the CRDG premium for Solar and Wind CRDG resources are:

- The incremental upfront cost of attracting a mix of residential customers and (typically) a smaller subset of commercial "anchor" customers to become subscribers to a given CRDG or other "shared solar" project; and
- The ongoing customer care/maintenance necessary to maintain a minimum number of subscribers at any given time.[3]

CRDG and other "shared solar" developers, owner-operators, or third-party subscriber management organizations must manage a vast array of operations to acquire and satisfy their customer-subscribers. These costs and/or services include (but are not limited to):

[3] Some RI REG stakeholders have also claimed that lenders and/or investors demand higher returns on their debt and equity to account for the customer acquisition and replacement risk. However, SEA has not, to date, seen clear and documented evidence (either publicly or on a confidential basis) of the typical financing premium it should assume when quantifying the CRDG premium.

- *Pre-Commercial Operation:* Marketing across multiple channels in a given eligible region for acquiring customers, acquiring physical and virtual billing and customer management systems, creating marketing collateral for subscribers, creating and managing a simple, scalable (and successful) enrollment process, and pursuing interested subscribers;
- *Post-Commercial Operation:* Marketing collateral to continue to engage and retain customers, the ongoing costs of maintaining customer care and/or call centers, the upfront capital and operating costs of maintaining a billing system (and syncing said billing system with the utility), processing payments from subscribers, and replacing departed subscribers.

While this process can be made somewhat less costly if a given developer, owner-operator or third-party provider has highly scaled operations in the same (or multiple) jurisdictions, these activities are complex and costly for any market participant who wishes to engage in them.

36. Please characterize the values utilized in the analysis of fixed upfront customer acquisition and ongoing customer maintenance and care costs involved in a CRDG project.

In developing the 2021 recommended ceiling prices, SEA utilized a value of $\$150/\mathrm{kW}_{DC}$ for the upfront, pre-commercial operation costs described above. For the incremental ongoing costs of customer maintenance and care (which we categorize as a form of incremental project operations and maintenance (O&M) costs), we assume a value of $\$25/\mathrm{kW}_{DC}$ per year.

37. What is the source of these cost estimates? Have they been vetted with stakeholders?

These values emanated from (and have been vetted informally with) nationally prominent CRDG and “shared solar” participants with substantial market share that view these figures as closely guarded trade secrets. As such, I am unable, pursuant to Rhode Island law, to provide more specific detail regarding my sources.

38. Please compare the uncapped levelized value of the incremental upfront capital and operating costs that comprise the incremental cost of a CRDG project to the statutory limits on the premium for Commercial and Large Solar CRDG projects.

Assuming the cost parameters discussed above, the Commercial Solar CRDG premia are approximately 2-3 ₵/kWh above the non-CRDG price if limited to the 15% cap in state law, and 3.3 ₵/kWh if no cap existed. For Large Solar projects, the non-CRDG upfront capital and operating costs are proportionally smaller than the fixed values described above that are utilized in the incremental cost analysis, and thus the premium at the 15% cap value is slightly under 1.8 ₵/kWh, while the uncapped value is 3.5 ₵/kWh. Thus, Large Solar CRDG projects would be by far the largest beneficiaries of the removal of the statutory CRDG premium cap. On the other hand, Wind projects (because of their much more substantial overall upfront capital and operating cost profiles), have CRDG prices well below the 15% statutory limit (representing a premium of 2.4 ₵/kWh).

JK Schedule 14 is a derivation of the Commercial Solar, Large Solar, and Wind CRDG and non-CRDG prices that SEA would recommend in the absence of the 15% premium limit imposed by R.I.G.L. § 39-26.6-27(e)(2), as compared to the CRDG and non-CRDG ceiling prices actually being proposed.

39. Do you believe that these values could be a subject of further analysis and targeted for possible reductions in future program years?

Yes. As with all inputs to the analysis, SEA believes it would be reasonable to potentially revisit these cost figures with market participants during the 2022 ceiling price development process.

40. At the August 13, 2020 technical meeting in Docket 4604, Chairman Gerwatowski asked that you compare the ultimate 2021 program year ceiling prices for Large Solar CRDG projects with contractual offers for customer offtake for larger-scale Community Remote Net Metering (CRNM) projects in order to determine the reasonableness of the Commercial Solar and Large Solar CRDG values. Have you reviewed any such agreements since the time of that technical meeting? If yes, please detail your findings.

Yes, I have. Overall, I maintain (as I did at the August 13 technical meeting) that comparing Large CRDG ceiling prices with CRNM offtake agreements is not an apt means for assessing the economics of a fully-bundled Large Solar CRDG revenue stream.

As an example, I attach **JK Schedule 15**, a third-party consultant's assessment of two offtake agreement offers for CRNM projects for Coventry Public Schools. As shown on the third page – and regardless of whether the agreement calls for a fixed price or fixed percentage discount - the value conveyed to the offtaker is not the sole income stream of the project, and thus is not an appropriate proxy for its revenue requirement. As shown on that page, the total net metering credit is substantially higher than either potential offtake agreement, and (unlike CRDG projects, which must accept a fixed revenue stream) is forecasted to escalate over time.

Also, unlike CRDG projects, which must surrender their energy, capacity market rights and any title to renewable energy credits ("RECs"), National Grid's CRNM tariff permits participants to monetize their REC revenue (if they choose to do so) and can further work to participate in the Forward Capacity Market ("FCM"), even while barring participation in wholesale energy markets. Finally, the fixed nature of the CRDG revenue stream to the developer (less the fixed customer credit) results in a substantially lower levelized cost of energy (LCOE) than for a CRNM project, which only has the offtake agreement as its primary hedge. This makes comparing the economics of each type of project even more difficult, in the absence of clear build cost or other information.

41. Do you believe that the proposed ceiling prices are in line with typical pricing for CRDG projects?

Yes. While Commercial-Solar CRDG projects are somewhat less common overall (and thus there are not as many potential projects to compare pricing to), it is our understanding (based on confidential discussions with market participants) that typical 20-year levelized revenue requirements for projects between 1 and 5 MW_{DC} can vary between 12-14 ₵/kWh over the term of a 20-year bundled tariff. As such, we believe the proposed prices are a reasonable ceiling price under which well-capitalized and creditworthy developers can compete to offer the best price without providing below-market rate returns to debt and equity investors.

<u>Interconnection Costs</u>

42. How do the proposed 2021 ceiling prices account for the cost of distribution system interconnection?

Each year, SEA requests National Grid's database of Massachusetts and Rhode Island interconnection costs on a project-by-project basis. While these values are not specifically added to the build costs collected by SEA in other Northeastern states (since interconnection costs are presumed, based on experience, to be included), we utilize these interconnection cost data to remove interconnection costs from the basis for the ITC, and from utilizing 5-year MACRS depreciation, a form of accelerated depreciation. Therefore, if interconnection costs rise (and all other factors remain equal), the amount of project costs removed from the basis for calculating these federal tax benefits will rise, thereby increasing the ceiling price. If interconnection costs were to drop, ceiling prices would drop for the same reasons outlined above.

43. Please describe how SEA calculated the upfront capital costs associated with interconnection.

As in previous years, SEA calculated the average cost of interconnection across Massachusetts and Rhode Island in the dataset provided by National Grid, which included data through the middle of 2020. However, given the slowdown in interconnection and progress to commercial operation caused by the pandemic, we widened the scope of analysis to include the full year 2019, as well as the available 2020 data. Error! Reference source not found. **Schedule 16** below shows these interconnection costs for the Solar and Wind classes.

44. Does the interconnection approach differ for the Hydro and Anaerobic Digestion classes?

The approach to accounting for interconnection costs is the same for the Hydro and Anaerobic Digestion classes in that interconnection costs are separated from other capital costs and not included in the basis for federal tax benefits. However, given the scarcity of hydro and anaerobic digestion projects, the value of the interconnection cost assumption was derived based on stakeholder feedback. The impact of the magnitude of interconnection costs is smaller for Hydro and Anaerobic Digestion as these projects do not qualify for federal tax credits, so the impact is limited to the difference in depreciation schedules.

<u>Reasonableness of 2021 Recommended Ceiling Prices</u>

45. Does SEA believe that the importance of both policy objectives and cost-effectiveness were considered in its analysis and recommendations?

Yes. SEA believes that the recommended ceiling prices represent an effective balance among all the policy objectives of Rhode Island law.

46. Does SEA believe that the ceiling prices approved by the DG Board on September 23, 2019 and recommended to the Commission are reasonable and are in the best interests of the State of Rhode Island and meet the renewable program's goals and objectives?

Yes.

47. Will SEA, as it has been in prior years, make appropriate adjustments to the ceiling prices if there are intervening changes in federal tax, trade or other policies that affect the economics of REG-eligible projects?

Yes.

48. Does SEA believe that the ceiling price development process used for the 2020 REG program was consistent with all prior years in which the PUC has approved the Ceiling Prices?

Yes.

<u>Public Policy Adder Development Process</u>

49. Did SEA engage in any other efforts during the 2021 REG program development process to develop compensation values for eligible projects?

Yes. In addition to leading the development of the 2021 recommended ceiling prices, SEA also engaged in developing performance-based compensation rate adders for projects intended to satisfy OER, National Grid and the Board's public policy goals (hereafter referred to as "Public Policy Adders" or simply "adders").

50. Please describe the process by which SEA came to be engaged in developing Public Policy Adders for the 2021 REG program year.

In PUC Order 23849 (issued in Docket 4983 on June 23, 2020), the PUC laid out the following guidelines for National Grid's development and proposal of Public Policy Adders:

- Work with OER and the DG Board to develop a set of public policy goals and clearly explain how these goals are consistent with statutory guidelines and with the requirements established in Docket No. 4600.
- Define the scope of each proposal, allowing SEA to provide "meaningful input" into the design of any proposed adders and design a pilot program for consideration by the DG Board.
- Utilize the Docket No. 4600 Guidance Document when designing each proposed adder and provide a cost benefit analysis; and
- The Company must carry the burden of proof that the proposals brought before the PUC are reasonable and should be adopted.

51. Do you believe that SEA was able to provide the type of "meaningful input" described in PUC Order 23849?

Yes, I do. Our team has worked extensively with OER, the Board, National Grid and REG stakeholders since April 2020 on the development of Public Policy Adders.

52. Please describe the near-term public policy goals jointly developed by OER, the DG Board and National Grid to guide development of the proposed Public Policy Adders for the 2021 program year.

Following a process (driven in part by Docket 4604) to consider which public policy goals were seen by each entity as the most important, OER, the DG Board and National Grid jointly agreed (following the May 2020 DG Board meeting) that the following goals should form the basis for developing Public Policy Adders during the 2021 program year:

- *Encouraging Beneficial Siting:* OER, National Grid and the DG Board jointly agreed that renewable energy projects with environmentally-beneficial siting characteristics (including but not limited to projects sited on rooftops, carports/canopies, landfill and brownfields) are an important goal to pursue.
- *Discouraging Detrimental Siting:* OER, National Grid and the DG Board also agreed that potential compensation rate subtractors should be considered for renewable energy projects sited on parcels in which development would cause undue environmental damage and/or be inconsistent with the most optimal use of the land.
- *Sharing Economic Benefits of Solar with People of All Income Groups:* Finally, OER, National Grid and the DG Board agreed that renewable energy projects that provide clear and tangible benefits to participants from low- or moderate-income households were of high value and should be pursued for further investigation of potential adders during the 2021 program year.

53. Are OER, National Grid and the DG Board proposing a compensation rate subtractor for projects that are sited in a more environmentally detrimental manner?

No. Ultimately, OER, National Grid and the DG Board concluded that there was not a sufficient foundation in state law for proposing a compensation rate subtractor.

54. Does SEA have experience with assisting other New England states with the type of incremental cost analysis necessary to develop compensation rate adders for distributed solar projects to address their own public policy goals?

Yes. In addition to assisting the New Jersey Board of Public Utilities ("NJ BPU") and the Massachusetts Department of Energy Resources ("MA DOER") with developing transitional renewable energy credit ("TREC") and solar renewable energy credit ("SREC") factors to incentivize projects that help to meet those state's public policy goals, SEA assisted DOER with developing initial compensation rate adder values for the Solar Massachusetts Renewable Target ("SMART") program.

55. How does Massachusetts utilize compensation rate adders in the SMART program?

Under the SMART program, project developers/owners can take advantage of multiple types of performance-based adders that compensate projects based on location, power purchaser, or other attributes shown to have both higher costs and greater public policy benefits than greenfield, ground-mounted solar projects.[4]

56. Describe SEA's approach to developing appropriate compensation values for various types of distributed solar resources?

As described in my answers above regarding the ceiling prices, SEA's main tool for these analyses is the CREST model. CREST takes, as inputs, all the capital and operating costs of the various projects being analyzed and calculates the net present value ("NPV") of the revenue requirement per kWh needed to cover these costs and meet the assumed investor return thresholds. When calculating the RI REG ceiling prices, CREST calculates the total revenue the project needs over its useful life, less the amount of tax benefits the project is assumed to monetize.

[4] See 225 CMR 20.00

57. Given this approach, how did SEA develop the proposed Public Policy Adder values?

To calculate appropriate adder values, we compared the revenue requirements of greenfield ground-mounted projects to the revenue requirements for projects intended to create a material degree of public policy value (e.g. projects sited in a societally-beneficial manner, projects serving low income customers, etc.) of the same size. Projects suspected to offer enhanced public policy value tend to have incremental capital and operating costs relative to greenfield ground-mounted projects of the same size (as well as lower energy production compared to optimally sited greenfield projects). The adder is intended to represent, on a cents/kWh basis, the revenue required to make up the net difference in capital costs, operating costs and production, enabling qualifying projects to achieve the same investor returns.

JK Schedule 17 is a graphical depiction of the types of inputs associated with a representative resource. The CREST model uses these inputs to calculate the levelized revenue requirement for each resource. In addition, **JK Schedule 18** illustrates the components of the incremental revenue requirement for certain preferred project types (relative to a typical REG solar project) that a Public Policy Adder is designed to meet.

58. How did SEA collect the cost and performance data needed to develop proposed adders for the types of preferred resources under consideration?

SEA surveyed 27 Rhode Island and regional distributed solar market participants. Via a screening question, SEA was able to verify that the developers participating in the survey had experience (and often significant experience) in each of the market sectors in which they provided information. To elicit responses regarding upfront capital and operating costs of these types of projects – figures that developers and project owners are often reluctant to share – SEA's survey instrument utilized data SEA has obtained through other market research efforts regarding the costs of various types of solar projects (including those with potential to meet OER, the Board and National Grid's public policy goals). SEA then asked survey respondents to verify the accuracy of the data, or otherwise provide more accurate data regarding the overall cost and production profile of each project type. The survey instrument utilized can be seen appended as **JK Schedule 19**.

59. For what types and sizes of preferred projects did SEA request information from stakeholders?

Based on the public policy goals that OER, the DG Board and National Grid previously agreed upon, SEA targeted the following potential categories (and eligible system sizes) of preferred projects for analysis.

- Rooftop Solar (26-250 kW_{DC}, 251-999 kW_{DC} and 1-5 MW_{DC})
- Carport Solar (26-250 kW_{DC}, 251-999 kW_{DC} and 1-5 MW_{DC})
- Low- and Moderate-Income (LMI) Roof Mount (26-250 kW_{DC}, 251-999 kW_{DC} and 1-5 MW_{DC})
- LMI Ground Mount (26-250 kW_{DC}, 251-999 kW_{DC} and 1-5 MW_{DC})
- Landfill Solar (26-250 kW_{DC}, 251-999 kW_{DC} and 1-5 MW_{DC})
- Brownfield Solar (26-250 kW_{DC}, 251-999 kW_{DC} and 1-5 MW_{DC})

60. Why were Small Solar projects <=25 kW_{DC} not included in the analysis?

OER and National Grid opted not to study projects <=25 kW_{DC} for potential Public Policy Adder development because most of these projects are (and will likely continue to be) roof-mounted, and thus already serve a public policy-driven purpose.

61. Please summarize your findings from the market participant survey regarding the drivers of incremental capital and operating costs and changes in production for the types and sizes of preferred projects in question.

A detailed summary of these findings for each type of potentially preferred resource can be found on pages 13-17 of SEA's August 28, 2020 presentation (hereafter **JK Schedule 20**).

62. Did SEA utilize sensitivity analysis to develop a range of potential adder values?

Yes. In my experience, when attempting to create reliable estimates with parameters that can vary substantially, it is wise to include sensitivity analyses to demonstrate the range of potential outcomes. In the case of these resources, the key sources of uncertainty in terms of their levelized incremental cost are their upfront cost, their production and (to a lesser extent) their operating costs.[5]

To evaluate the potential variance in proposed adder values, SEA developed four sensitivities for each type of potentially preferred resource. These include:

- *Low Cost/High Production:* SEA assumes upfront capital costs at the 1st quartile of survey responses for that resource, while also assuming production at the highest end of the range of potential estimates. These sensitivities produce adder values at the lowest end of the range.
- *Low Cost/Low Production:* SEA assumes upfront capital costs at the 1st quartile of survey responses for that resource, but also assumes production levels at the lower end of the range.
- *High Cost/High Production:* SEA assumes upfront capital costs at the 3rd quartile of survey responses for that resource, while also assuming production at the highest end of the range of potential estimates.
- *High Cost/Low Production:* SEA assumes upfront capital costs at the 3rd quartile of survey responses for that resource, while also assuming production at the lowest end of the range of potential estimates. These sensitivities produce adder values at the highest end of the range.

For more information on the exact parameters assumed in the incremental cost analysis (for each resource and corresponding case), please see page 18 of **JK Schedule 20**.

63. Please provide the incremental cost and performance inputs SEA obtained from the survey data and used to calculate the initial draft public policy adders.

The specific ranges (and/or point estimates) of upfront capital and operating costs included in SEA's draft Public Policy Adder sensitivity analysis can be found on page 17 of **JK Schedule 20**.

[5] The low and high production assumptions are based on a mixture of public data (specifically, from the National Renewable Energy Laboratory's (NREL's) 2020 Annual Technology Baseline for commercial solar PV projects) with a significant (but confidential) dataset of project in development in Rhode Island by a highly engaged market participant. The confidential stakeholder database contained detailed information about projects, including whether such projects were roof-mounted, ground-mounted, carport-mounted or had a mixed mounting scheme. For more information, please see page 26 of SEA's August 28, 2020 stakeholder meeting presentation.

64. Please summarize the results of from SEA's initial quantitative analysis of the potential Public Policy Adders under consideration.

The results of our initial analysis can be found on page 21 of **JK Schedule 20** stakeholder presentation. Overall, we found that relative to similar adders currently available under the SMART program, the draft adder values calculated in the Low Cost/High Production sensitivity were lower (except in the case of LMI rooftop).

65. Were the results of these analyses discussed and shared with stakeholders?

Yes. SEA and National Grid held virtual technical meetings with stakeholders on July 13, August 28, September 18 and September 29, 2020 (the latter concurrent with the September 2020 DG Board meeting). The presentations from July 13, September 18 and September 29, 2020 presentations from these meetings can be found attached as **JK Schedule 21**.

66. What feedback did SEA receive from stakeholders regarding the incremental cost and performance assumptions and draft results?

SEA did not receive any specific feedback on the input assumptions from stakeholders outside the context of the survey (which most engaged stakeholders in this process participated in). The comments during the Public Policy Adders process mainly concerned feedback to National Grid on potential program design and eligibility issues.

67. Were the Public Policy Adder values developed by SEA utilized by National Grid in their benefit-cost analyses for the two adder pilot programs proposed for the 2021 program year?

Initially, yes. When conducting their initial round of quantitative benefit-cost analysis, National Grid utilized SEA's Low Cost/High Production case values for all the types of potentially preferred resources under consideration for adder development. However, as National Grid began to refine their specific adder proposals in conjunction with OER and SEA, the company replaced the draft values discussed above with the values discussed as part of that collaboration.

68. Did National Grid choose to move forward with all the potential Public Policy Adders for which SEA developed quantitative incremental cost estimates as part of the incremental cost analysis?

No. The Company determined that it did not wish to pursue either a specific rooftop solar adder, or landfill or brownfield solar adders, citing its own cost analysis. As a result, these categories were not refined further. However, the company decided to propose a Low Income CRDG adder, and to propose continuation of the existing Carport Solar adder pilot program.

69. Did SEA refine its Carport and Low Income CRDG adder calculations following attempts to seek stakeholder feedback? If so, how?

Yes. Following the initial stakeholder engagement processes and National Grid's decision to focus on Carport Solar and Low Income CRDG adder development, SEA developed new estimates. These estimates were developed in response to National Grid's request for a sensitivity in which SEA assumed that operating costs for a Carport Solar project were at the 1st quartile value of the results derived from the survey (instead of at a mean value of our incremental cost survey results). In addition, it became clear that

National Grid intended to propose a blanket adder for both roof- and ground-mounted LMI projects, so we therefore adjusted our weighted average calculations.

70. Please provide the results of SEA's revised analysis of the Carport Solar and Low Income CRDG Solar adder values.

Overall, our estimates yielded a range of Carport Solar adder values of between 4.9 and 7.7 ₵/kWh, and a range of LMI results (representing an average of roof- and ground-mounted projects) of between 3.0 and 4.2 ₵/kWh. Please see **JK Schedule 22** for detailed weighted average calculations of this incremental cost value.

71. Do you believe that the Low Income CRDG adder of 3.0 ₵/kWh proposed by National Grid is consistent with the values yielded by SEA's analysis?

Yes. The value chosen by National Grid is the average of SEA's estimates for LMI roof-mounted projects and LMI ground-mounted projects under a low cost and high production scenario. As such, I expect this adder to provide sufficient compensation to cover the higher initial cost of LMI customer acquisition relative to a typical non-low income CRDG subscriber and meet investor return thresholds.

72. Do you believe that the continuation of the Carport Solar adder pilot program at a reduced value of 5.0 ₵/kWh proposed by National Grid is consistent with the values yielded by SEA's analysis?

Yes. As also discussed in Ms. Daniel's testimony, the proposed value falls within a range of values derived in our analysis of the incremental cost of a Carport Solar project under the Low Cost/High Production sensitivity set described above. As such I believe it is sufficient to cover the incremental costs of carport development, construction and operations, and thus meet market-based investor return thresholds.

73. Based on your analysis, would you recommend the approval of the proposed Low Income CRDG pilot program, as well as the continuation of the Carport Solar pilot for one additional program year?

Yes.

74. Does this conclude your testimony?

Yes.

JK Schedule 1 –RI REG-Specific CREST Models Shared with Stakeholders

See files named:

1. *JK Schedule 1 (Part A) - RI_REG_2021_CREST_Solar-Wind-Hydro_PublicFacing.xlsx*
2. *JK Schedule 1 (Part B) RI_REG_2021_CREST_AD_PublicFacing.xlsx*

JK Schedule 2 – Total Number of Stakeholder Responses to Data Requests and Surveys by Category

Total Number of Stakeholder Responses to Data Requests and Surveys by Category		
Technology	Total Stakeholder Responses Submitted by Category	
	1st Round[6]	2nd Round[7]
Solar	23	19
Wind	2	2
Anaerobic Digestion	0	0
Small Scale Hydropower	1	0

6 Ahead of July 28, 2020 Presentation.

7 Ahead of September 8, 2020 Presentation.

JK Schedule 3 - Initial Data Request and Survey for 2021 Ceiling Price Process

See file named: JK Schedule 3 - Initial Data Request and Survey for 2021 Ceiling Price Process.pdf

JK Schedule 4 –Supplemental Data Request #1 (Financing Assumptions)

See file named: JK Schedule 4 - Supplemental Data Request #1 (Financing Assumptions).pdf

JK Schedule 5 – Second Supplemental Data Request and Survey (Other Cost and Performance Assumptions)

See file named: JK Schedule 5 - Supplemental Data Request #2 (Other Cost and Performance Assumptions).pdf

JK Schedule 6– RI REG 2021 Ceiling Price Process Stakeholder Presentations

See file named: JK Schedule 6 - RI_REG_2021_Ceiling Price Process Stakeholder Presentations.pdf

JK Schedule 7 – 2021 Proposed Renewable Energy Classes and Eligible System Sizes

2021 Proposed Renewable Energy Classes and Eligible System Sizes	
Renewable Energy Class	**Eligible System Sizes**
Small Solar I	1-15 kW_{DC}
Small Solar II	16-25 kW_{DC}
Medium Solar	26-250 kW_{DC}
Commercial Solar	251-750 kW_{DC}
	751- 999 kW_{DC}
Large Solar	1-5 MW_{DC}
Wind	$\leq$ 5 MW_{AC}
Anaerobic Digestion	$\leq$ 5 MW_{AC}
Small Scale Hydropower	$\leq$ 5 MW_{AC}
Community Remote – Commercial Solar	251-750 kW_{DC}
	751-999 kW_{DC}
Community Remote – Large Solar	1-5 MW_{DC}
Community Remote – Wind	$\leq$ 5 MW_{AC}

JK Schedule 8 – Comparison of 2020 Approved and 2021 Proposed Renewable Energy Classes and Eligible System Sizes

Comparison of 2020 Approved and 2021 Proposed Renewable Energy Classes and Eligible System Sizes			
2020 Final Approved		2021 DG Board Recommended	
Renewable Energy Class	Eligible System Sizes	Renewable Energy Class	Eligible System Sizes
Small Solar I	1-10 kW_{DC}	Small Solar I	1-15 kW_{DC}
Small Solar II	11-25 kW_{DC}	Small Solar II	16-25 kW_{DC}
Medium Solar	26-250 kW_{DC}	Medium Solar	26-250 kW_{DC}
Commercial Solar	251-999 kW_{DC}	Commercial Solar	251-750 kW_{DC}
			751-999 kW_{DC}
Large Solar	1-5 MW_{DC}	Large Solar	1-5 MW_{DC}
Wind	$\leq$ 5 MW_{AC}	Wind	$\leq$ 5 MW_{AC}
Anaerobic Digestion	$\leq$ 5 MW_{AC}	Anaerobic Digestion	$\leq$ 5 MW_{AC}
Small Scale Hydro	$\leq$ 5 MW_{AC}	Small Scale Hydro	$\leq$ 5 MW_{AC}
Community Remote – Commercial Solar	251-999 kW_{DC}	Community Remote – Commercial Solar	251-750 kW_{DC}
			751-999 kW_{DC}
Community Remote – Large Solar	1-5 MW_{DC}	Community Remote – Large Solar	1-5 MW_{DC}
Community Remote – Wind	$\leq$ 5 MW_{AC}	Community Remote – Wind	$\leq$ 5 MW_{AC}

JK Schedule 9 – 2021 Proposed Ceiling Prices, Eligible System Sizes and Tariff Terms

2021 Proposed Ceiling Prices, Eligible System Sizes and Tariff Terms			
Renewable Energy Class	**Tariff Term (Years)**	**Eligible System Size**	**Ceiling Price (¢/kWh)**
Small Solar I	15	1-15 kW_{DC}	29.95
Small Solar II	20	16-25 kW_{DC}	25.85
Medium Solar	20	26-250 kW_{DC}	22.25
Commercial Solar	20	251-750 kW_{DC}	19.05
		751-999 kW_{DC}	15.75
Community Remote – Commercial Solar	20	251-750 kW_{DC}	21.91
		751-999 kW_{DC}	18.11
Large Solar	20	1-5 MW_{DC}	11.85
Community Remote – Large Solar	20	1-5 MW_{DC}	13.63
Wind	20	$\leq$ 5 MW_{AC}	20.05
Community Remote – Wind	20	$\leq$ 5 MW_{AC}	22.45
Anaerobic Digestion	20	$\leq$ 5 MW_{AC}	21.15
Small Scale Hydropower	20	$\leq$ 5 MW_{AC}	27.35

JK Schedule 10 – Percentage Change from 2020 Approved to 2021 Proposed REG Ceiling Prices

Percentage Change from 2020 Approved to 2021 Proposed REG Ceiling Prices		
Category	**Eligible System Size**	**% Change (2020-2021)**
Small Solar I	1-15 kW_{DC}	1%
Small Solar II	16-25 kW_{DC}	10%
Medium Solar	26-250 kW_{DC}	5%
Commercial Solar	251-750 kW_{DC}	4%
	751-999 kW_{DC}	-14%
Community Remote – Commercial Solar	251-750 kW_{DC}	4%
	751-999 kW_{DC}	-14%
Large Solar	1-5 MW_{DC}	-13%
Community Remote – Large Solar	1-5 MW_{DC}	-13%
Wind	$\leq$ 5 MW_{AC}	6%
Community Remote –Wind	$\leq$ 5 MW_{AC}	7%
Anaerobic Digestion	$\leq$ 5 MW_{AC}	38%
Small Scale Hydropower	$\leq$ 5 MW_{AC}	28%

JK Schedule 11 – Percentage Change in Upfront Capital Costs for Selected Proxy Solar Projects from 2020 Approved to 2021 Proposed REG Ceiling Prices

Percentage Change in Upfront Capital Costs for Selected Proxy Solar Projects from 2020 Approved to 2021 Proposed REG Ceiling Prices				
Category	**Eligible System Size(s)**	**2020 Approved**	**2021 Proposed**	**% Change**
Small Solar I	1-15 kW_{DC}	$3,279	$3,146	-4%
Small Solar II	16-25 kW_{DC}	$2,979	$2,883	-3%
Medium Solar	26-250 kW_{DC}	$2,360	$2,332	-1%
Large Solar	1-5 MW_{DC}	$1,602	$1,492	-7%

JK Schedule 12 – Impact of Federal Investment Tax Credit (ITC) January 1, 2021 Phase-Down from 26% to 22%

Impact of Federal Investment Tax Credit (ITC) January 1, 2021 Phase-Down from 26% to 22%				
Category	**Eligible System Size**	**% Change from 2020 CPs, Statutory 2021 22% ITC**	**% Change from 2020 CPs, Previous 2020 26% ITC**	**ITC-Related Cost Increase (%)**
Small Solar I	1-15 kW_{DC}	1%	-3%	4%
Small Solar II	16-25 kW_{DC}	10%	4%	6%
Medium Solar	26-250 kW_{DC}	5%	0.5%	4.5%
Commercial Solar (& Commercial CRDG)	251-750 kW_{DC}	4%	-1%	5%
	751-999 kW_{DC}	-14%	-18%	4%
Large Solar (& Large CRDG)	1-5 MW_{DC}	-13%	-18%	5%

JK Schedule 13 – Comparison of Difference between Commercial Solar and Large Solar Pricing under "Option A" and "Option B"

Comparison of Difference between Commercial Solar and Large Solar Pricing under "Option A" and "Option B"			
Commercial Solar Pricing Option	**Proposed 2021 Comm'l Solar Ceiling Price (₵/kWh)**	**Proposed 2021 Large Solar Ceiling Price (₵/kWh)**	**Δ (Diff.) (₵/kWh)**
Option A (Commercial Solar 251-999 kW_{DC}, 500 kW_{DC} Modeled Size)	17.65	11.85	5.8
Option B **(Commercial Solar 751-999 kW_{DC}, 900 kW_{DC} Modeled Size)**	**15.75**	**11.85**	**3.9**

JK Schedule 14 – Comparison of Non- Community Remote DG Prices to CRDG Prices With and Without 15% Statutory Premium Caps by Category

Comparison of Non- Community Remote DG Prices to CRDG Prices With and Without 15% Statutory Premium Caps by Category				
Renewable Energy Class	**Size**	**Non-CRDG Price (₵/kWh)**	**CRDG Price (15% CRDG Cap, ₵/kWh)**	**CRDG Price (Uncapped, ₵/kWh)**
Commercial Solar	251-750 kW_{DC}	19.05	21.91	22.35
Commercial Solar	751-999 kW_{DC}	15.75	18.11	19.05
Large Solar	1-5 MW_{DC}	11.85	13.63	15.35
Wind	0-5 MW_{AC}	20.05	22.45[8]	22.45[9]

8 This value is the actual proposed Wind CRDG price, rather than the 15% limit. A Wind CRDG price that reaches the 15% limit would be 23.86 ₵/kWh.

9 Ibid.

JK Schedule 15 – Summary of Community Solar Opportunity in Rhode Island (Compiled by Balanced Rock Energy for Coventry Public Schools)

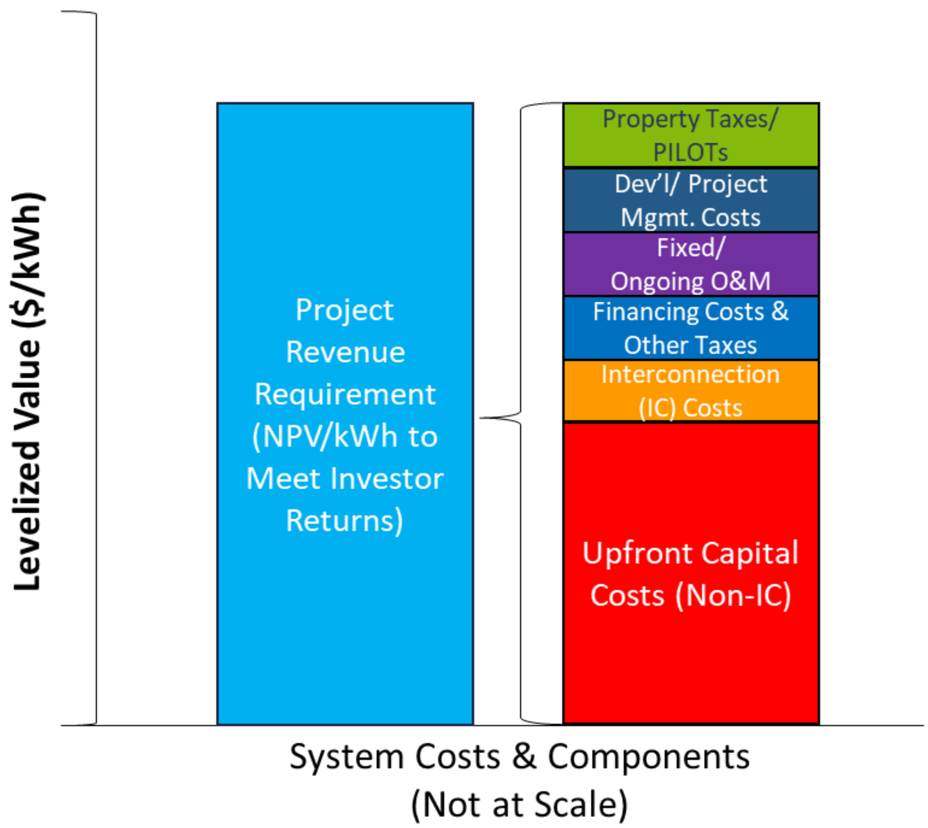
See file named: JK Schedule 15 – Summary of Community Solar Opportunity in Rhode Island.pdf

JK Schedule 16 – Comparison of 2020 Approved and 2021 Proposed National Grid- Supplied Distribution Interconnection Costs for Projects Larger than 25 kW_{DC}

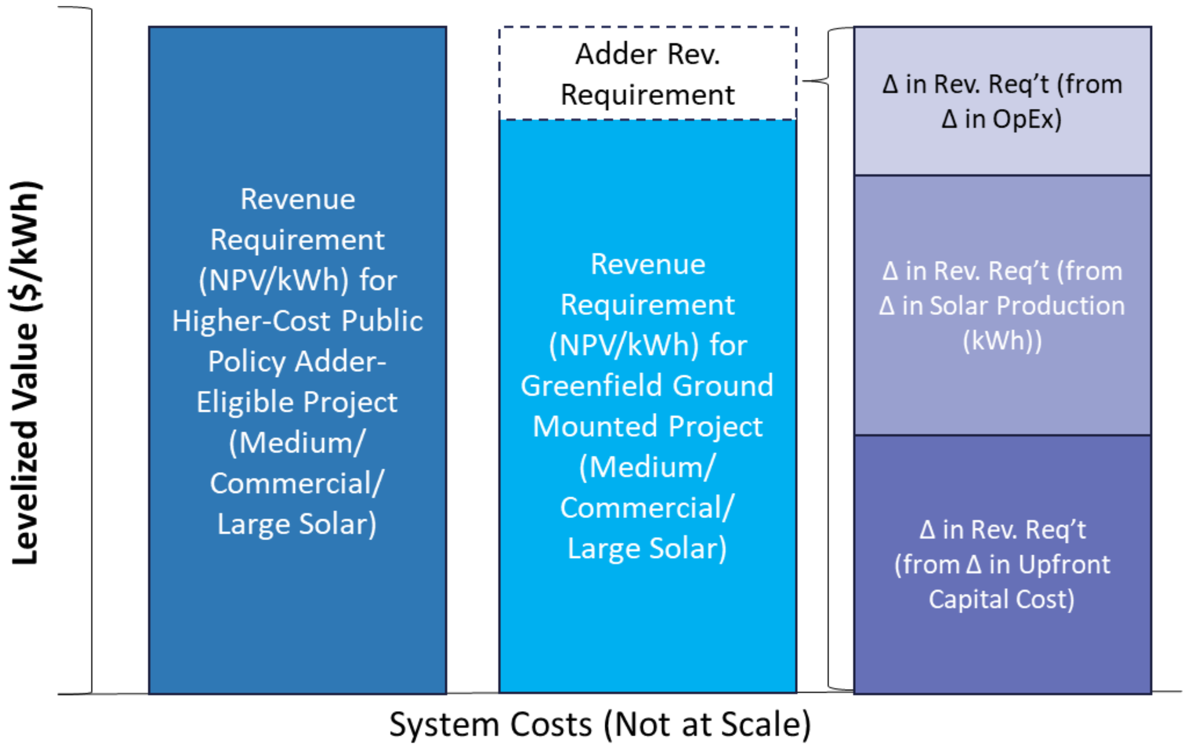
Comparison of 2020 Approved and 2021 Proposed National Grid- Supplied Distribution Interconnection Costs for Projects Larger than 25 kW_{DC}			
Renewable Energy Class	**Eligible System Size**	**IC $/$kW_{DC}$ (2020 Approved Prices)**	**IC $/$kW_{DC}$ (2021 Recommended Prices)**
Medium Solar[10]	25-250 kW_{DC}	$49	$118
Commercial Solar	251-999 kW_{DC}	$151	$133
Large Solar	1-5 MW_{DC}	$134	$147
Wind	0-5 MW_{AC}	$295	$295

10 We assume interconnection is a relatively small fee per unit of capacity for Small Solar projects, and thus included in the purchase price for these projects. As such, we do not have a separate interconnection cost estimate for these projects.

JK Schedule 17 – Illustrative Components of Levelized Cost of Energy (LCOE)/Revenue Requirements Measured Using CREST Model



JK Schedule 18 – Illustrative Derivation/Components of Public Policy Adder Revenue Requirements



JK Schedule 19 - 2021 REG Public Policy Adders Incremental Cost Survey

See file named: JK Schedule 19 - 2021 REG Public Policy Adders Incremental Cost Survey.pdf

JK Schedule 20 – SEA's August 28, 2020 Public Policy Adders Presentation to Stakeholders

See file named: JK Schedule 20 - SEA & National Grid Second Stakeholder Meeting Presentation_FINAL (As Filed)

JK Schedule 20 – July 13, September 18 and September 29, 2020 Presentation to Stakeholders in Public Policy Adder Development Process

See Files Named:

1. *JK Schedule 21 - Consolidated Set of Public Policy Adder Process Presentations*
2. *JK Schedule 21 - National Grid September 18 Stakeholder Webinar*

JK Schedule 22 – Final Estimates of Carport and LMI Incremental Costs

See file named: JK Schedule 22 – Final Carport and LMI Adder Results_FINAL.xlsx

Pre-Filed Direct Testimony of Kate Daniel – Sustainable Energy Advantage

1. Please state your name, employer and title.

My name is Kate Daniel. I am a Consultant at Sustainable Energy Advantage, LLC.

2. Please provide your background related to renewable energy technologies, including your role with SEA's work on the REG program.

I have over ten (10) years of work experience related to energy and environmental policy and programs, and over six (6) years of experience directly related to renewable energy policy and markets. Since joining Sustainable Energy Advantage ("SEA") in 2016, I have played a key role in SEA's policy analysis practice area and have supported public sector clients in the design and implementation of renewable energy policies and programs.

Since 2017, I have worked with SEA to support State of Rhode Island Office of Energy Resources ("OER") and the Distributed Generation Board (DG Board) in making recommendations on the Renewable Energy Growth ("REG") Ceiling Prices. My roles within SEA's team have included research on the costs of distributed energy projects in Rhode Island and other northeastern states, engagement with R.I. renewable energy stakeholders, preparing and giving presentations to stakeholders and the DG Board, implementing improvements and updates to SEA's Cost of Renewable Energy Spreadsheet Tool (CREST) model, and running the Ceiling Price analysis using CREST.

In addition to supporting OER and the DG Board, I have led or played a pivotal role in SEA's work to support the New York State Energy Research and Development Authority (NYSERDA), the New Jersey Board of Public Utilities (BPU), and many private sector clients, on efforts related to renewable energy policy and distributed energy markets.

Prior to joining SEA, I was a Senior Policy Analyst with the North Carolina Clean Energy Technology Center, where I was a core member of the team that maintains the Database of State Incentives for Renewables and Efficiency. I provided resources, advisory support and training to local governments through the Solar Outreach Partnership, funded by the U.S. Department of Energy.

I received a Master of Public Policy from the University of California at Berkeley Goldman School of Public Policy, with a focus in energy and climate policy. Prior to my graduate studies, I was a Senior Research Analyst at Industrial Economics, Inc., where I supported private, state and federal government clients by conducting regulatory impact analyses, program evaluations, financial analyses and reviews of innovative environmental compliance programs.

Report Objectives and Methodology

3. Who are the members of the Consulting Team, and what was each member's role in the development of the Carport Adder evaluation report?

The Consulting Team consists of SEA and its subcontractor, Mondre Energy, Inc. ("Mondre"). Mondre conducted interviews with carport developers and municipal planning staff. Mondre's interview efforts included conducting outreach to stakeholders, developing interview questions, summarizing findings from the interviews, and drafting sections of the report related to interview findings.

SEA designed and conducted a survey on incremental costs of carports and other types of solar projects, analyzed available data, conducted cost-based modeling using the CREST model to assess the potential range of carport adder values, and in coordination with National Grid, developed a Benefit Cost Analysis of the Carport Adder Pilot. SEA drafted the final evaluation report.

4. What were the objectives of the carport adder pilot program?

On February 18, 2020, the PUC voted to approve a ceiling price adder for carport installations on a pilot basis for the 2020 REG Program Year. The adder level was set to 6.0 cents/kWh and applied to carport projects in the Commercial Solar and Large Solar classes, subject to a 6 MW cap. In its written Report and Order to approve the 2020 Program Year Ceiling Prices, MW Allocation and the Carport Pilot, the PUC noted that the purpose of the Carport Pilot was to collect additional data on whether the adder would advance the REG program's public policy objectives and allow for a more in-depth BCA based on Docket No. 4600 guidelines.

5. What were the scope and objectives of the evaluation report?

The purpose of the evaluation report was to determine if the carport adder pilot program demonstrated that a carport adder meets public policy objectives and results in identifiable benefits to customers. The evaluation was designed to address specific learning objectives identified by the DG Board and OER in response to PUC Data Requests in Docket 4983. OER and the DG Board outlined a number of learning objectives related to the characteristics of carport projects proposed and awarded under the REG 2020 open enrollments, characteristics of carport projects more generally, the local approvals process for carports and the differences in development and permitting timelines and requirements between carports and non-carport solar projects. (See the first Appendix in the Carport Evaluation Report, **KD Schedule 1**, for the DG Board's response to PUC's Data Request Set 1 and OER's response to PUC's Data Request Set 2 in Docket 4983).

The PUC also directed OER and the DG Board to provide a progress report on the status of carport enrollments and any discernable differences between carport installations and other installations before moving to a full quantitative cost benefit analysis. These differences are discussed in the summary of findings below.

6. Please describe the methodology used to evaluate the carport adder.

First, in July 2020, SEA designed and conducted a survey to collect data on the incremental costs of various solar project types under consideration for a public policy adder. The survey included a set of questions designed to better understand the capital and operating costs of carport projects and how such costs differ between carport projects and similarly sized ground mount, greenfield projects. The survey utilized a methodology that has been successfully used by SEA in past surveys to collect sensitive cost data. SEA first conducted research using publicly available sources of carport data and the results of a prior survey to develop benchmark costs. Next, SEA asked survey respondents to indicate whether their experience suggested that the benchmark cost data were accurately representative, too low, or too high. Respondents were directed to provide a more accurate figure if they opined that the benchmark data did not reflect their experience. SEA has found that asking respondents to react to a specific benchmark results in a greater willingness to share cost information and more specific responses than when requesting open ended responses.

The Consulting Team then conducted interviews to supplement and expand upon the information collected in the survey. SEA utilized its network and experience working in DG markets across the Northeast to identify a list of solar developers active in the carport segment. SEA then facilitated introductions between those developers and Mondre. Mondre developed a list of interview questions based upon the learning objectives identified by the DG Board and OER and conducted interviews with all the developers that were responsive to the outreach.
Mondre also conducted interviews with municipal planners. Key municipalities and the appropriate staff were identified with the help of the Rhode Island chapter of the American Planning Association and the Rhode Island League of Cities and Towns. Mondre again identified a list of questions for municipal planning staff based upon the learning objectives and conducted interviews with all responsive municipalities.
Next, SEA requested and analyzed data from National Grid, including REG Open Enrollment data containing project cost information and bid prices for both carport projects and non-carport projects. Data provided by National Grid included interconnection cost data for all projects selected from past open enrollments (including selected carport projects) and for carport projects in the interconnection queue (which includes projects that have not submitted applications to the REG program).

Next, SEA collaborated with National Grid to design a cost benefit analysis and aggregate the necessary supporting inputs. In its decision approving the REG 2020 Program Year classes, ceiling prices, and carport pilot adder, the PUC outlined a process consistent with R.I. Gen. Laws § 39-26.6-22 for proposing a carport adder or any other public policy adder in 2021. The process places the burden on National Grid to define the scope and criteria for any proposed public policy adder, work with SEA to develop a proposed adder level and conduct a cost benefit analysis in accordance with Docket 4600 Guidance. Given the overlap in scope between SEA's evaluation of the 2020 Carport Adder and National Grid's design of a proposal for public policy adders for 2021, SEA worked closely with National Grid to ensure a consistent approach to evaluating the costs and benefits of adders under the REG program. The quantitative results of this analysis are summarized in the *Quantitative Cost-Benefit Analysis* section below.

SEA analyzed the carport development and construction cost data gathered from the surveys, interviews, and National Grid's open enrollments to model cost-based ceiling price adders for carport projects.

Finally, as directed by the PUC, the Consulting Team presented a progress report in August 2020 after the second open enrollment was announced but before National Grid filed the results. The presentation outlined the research and findings to date, including preliminary results of identifiable benefits to customers in the form of lower interconnection costs for carport projects and all other selected REG projects. SEA also presented the proposed methodology to measure additional benefits and costs of the carport adder based on the Docket 4600 framework. Please see **KD Schedule 2** for the presentation given at the Technical Meeting.

7. How many stakeholders responded to the survey?

A total of 27 stakeholders responded to the survey. Not all respondents were active in solar carport development. A total of 15 respondents answered questions related to the costs of carport development.

8. How many stakeholders participated in interviews?

The Consulting Team reached out to 21 solar carport developers and Mondre was able to conduct interviews with nine developers. In addition, Mondre interviewed representatives from a total of 18 municipalities in Rhode Island.

9. **Did SEA revise the Carport Evaluation Report after it was presented to the DG Board?**

Yes. The final evaluation report filed with this testimony reflects minor revisions from the version presented to the DG Board. SEA discovered a transcription error in the interconnection cost benefits estimated in the High Benefits scenario as reflected in the original report. The corrected analysis and report reflect a reduction in the estimated net benefits in the High Benefits case by about $7/kW for both the Commercial and Large Solar categories, and a reduction in the resulting benefit-cost ratios by about 0.01. The revisions do not have a significant impact on the analysis outcomes and do not change SEA's conclusions or recommendations.

Summary of Findings

10. Please summarize the findings from the carport adder pilot evaluation report.

Only four carport projects bid into the 2020 open enrollments and only three were selected. It is not possible to determine definitively if this small number of projects is representative of the carport solar segment overall. However, the initial bid data and evaluation results indicate that these projects have measurable public policy benefits. Extending the carport pilot for another year would allow OER and the DG Board to collect additional data and better understand if the observations from the 2020 cohort would be applicable and consistent over a long-term program.

Interviews with developers and municipal planners suggest that carports are perceived more favorably than other types of solar projects and are therefore likely to obtain local permitting approvals on a faster schedule. However, carports have significant incremental costs and it is more difficult to find suitable carport sites than other types of solar sites. Developers indicated that the adder is important in their consideration of whether to pursue carport projects and several indicated that they would not propose a carport to the REG program without an adder. The data available shows significant differences in the interconnection costs between carport projects and other selected projects under the REG program. The magnitude of this benefit has some uncertainty, as it is based on a small number of projects and varies depending on the set of carport and non-carport projects analyzed.

The benefits of avoiding greenfield development are significant but difficult to quantify. To account for the uncertainty in defining the avoided greenfield project and how to assign a dollar value to the attributes of preserved land, we estimate the land use benefits as a range. The land use category with the largest impact is the avoidance of reduced property values that result from greenfield solar development near homes. The source and quantification of these values is discussed in the *Quantitative Cost-Benefit Analysis* section below.

When the benefits are assumed to be on the high end of the range, the benefits exceed the costs of the 2020 carport adder for the Commercial Solar class and are almost equal to the costs for the Large Solar class. We estimate the benefit cost ratios for the 2020 carport adder pilot to range from 0.49 to 3.04, depending on the class and benefit/cost scenario assumed.

To estimate cost-based adders, we use the incremental project costs as reflected in the open enrollment data. We estimated adders needed under high and low production scenarios, as well as under low and median cost assumptions. The modeling resulted in a range of adders from 4.9 cents to 7.7 cents, with adders on the low end of the range corresponding to the most cost-effective projects modeled.

National Grid has proposed continuing the carport pilot program using an adder of 5 cents per kWh for 2021. With a 5.0 cent adder, the benefit cost ratios range from 0.58 to 3.64. The cost-benefit analysis of a 5.0 cent adder indicates a strong likelihood that the carport adder results in net benefits to ratepayers.

Findings from Interviews and Qualitative Results

11. What did the Consulting Team's research reveal regarding the locations of proposed and potential carport projects?

Through the interviews and analysis of National Grid data, we sought information based on the learning objectives related to where carport projects are, or are likely to be proposed – including on what types of sites, geographic and county distribution and the distribution across rural, suburban, or urban areas. Carport developers interviewed indicated that they are most likely to propose solar carports on commercial and industrial parking lots in suburban areas, given site suitability and development costs. Based on the locations of projects included in the open enrollment and interconnection data, most carport projects in development are on commercial and industrial properties. Providence County has seen the largest amount of carport activity to date.

12. Did the Consulting Team find that carports would be perceived differently than other types of solar projects?

Yes. Interviews with both developers and municipal planners indicated that carports would be perceived more favorably by the public because they would be located on sites that are already developed or in development, would avoid tree clearing, reduce stormwater runoff, and are perceived to avoid the aesthetic and historic preservation concerns sometimes attributable to ground mount and rooftop proposals.

13. What challenges do carports face in the development process?

Developers interviewed noted that it is difficult to find suitable sites large enough to host a Commercial Solar or Large Solar carport project. They reported that negotiating site leases and offtake agreements can present extra challenges compared to greenfield projects. Sites in commercial and retail zones may have competing uses and commercial properties suitable for carports are more likely to have master leases that require negotiation with multiple parties. Developers noted that these issues when combined with the economics of carports (without an adder) have hindered their ability to pursue carport projects.

14. How do municipalities permit and review carport projects?

Based on the Consulting Team's interviews with municipal planners, the permitting requirements and process for solar carports vary by municipality. The municipalities surveyed used approaches ranging from issuing permits by right to requiring master plan review, with the resulting time frames ranging from a matter of days to up to 6 months. Please see Table 5 in the report for further detail on the permitting processes and timelines utilized by Rhode Island municipalities.

15. Are there any permitting barriers to developing carport projects within municipalities?

Four of the municipalities interviewed (Burrilville, Cumberland, Smithfield and Lincoln) have received applications for carport projects. None of them reported any difficulties in handling the applications. Many of the municipalities surveyed have solar ordinances, but most of the ordinances do not specify how solar carports should be treated. Where a solar ordinance does not explicitly grant carport development as a permitted use, solar carports may be required to obtain a special use permit, undergo development plan review or obtain a variance. Though there is no uniform or streamlined permitting process adopted across the state, developers and planners alike indicated that acquiring approvals for a carport project is in no case more difficult than any other type of solar project, and may at times be faster or easier.

Carport Project Costs and Adder Level

16. Do carport projects face additional development and construction costs compared to other types of solar projects?

Yes. All the data we collected related to carport costs – from the survey, interviews and open enrollment data – support that carports have incremental development and construction costs compared to ground mount systems. Interviews provided that the incremental costs relate to additional costs of geotechnical engineering and studies, the costs of steel and other materials for the carport structure and decommissioning costs. The incremental cost varies based on the project design. For example, decommissioning costs may be lower if the structure will stay in place after the life of the system. Capital costs and engineering design costs will be higher if the carport structure is required to (or has otherwise agreed to) meet snow and water management criteria; as well as if the carport structure must be tall enough to allow clearance for trucks and emergency vehicles.

17. What data did the consulting team collect on the incremental costs of carports?

The survey, interviews and open enrollments produced data on the incremental costs of carports. Each source provided a different range of costs. The respondents to the survey provided installed cost figures for carports that ranged from \$0.70/W to \$1.48/W higher than ground mount projects.

18. How did the Consulting Team determine appropriate carport adder levels?

SEA conducted cost-based modeling using the CREST model. We ran multiple scenarios to account for a range of costs and production factors. We used the difference in the costs of carport projects and non-carport projects that bid into the 2020 Open Enrollments as the total installed costs input. We utilized results from the survey for operational expenses, including operations and maintenance, site lease, insurance and project management. We ran one case at the mean of the responses for those inputs and one case at the first quartile of those responses. We utilize data provided by stakeholders for the capacity factor assumptions and run cases for low production assumptions and high production assumptions. We find that the cost-based adders range from 4.9 cents in a low operational expense and high production scenario to 7.7 cents in a mean operational expense and low production scenario. For more information on the adder modeling, please see the testimony of Jim Kennerly (pages 19-38).

Quantitative Cost-Benefit Analysis

19. How did the consulting team measure the total costs of the carport adder pilot?

The total costs of the 2020 carport adder pilot are based on system production for a modeled carport project, sized 500 kW for the Commercial Solar class and 4,500 for the Large Solar class; the same modeled system sizes as for the main competitively bid classes. Under a low-cost scenario, we assume the modeled system has low production, using the same 13.1% capacity factor used in the low production scenario for the adder modeling. Under a high-cost scenario, we assume the modeled system has high production, again using the same 14.6% capacity factor utilized in the high production scenario for the adder modeling. We apply a 0.5% annual degradation factor to system production. We then apply the \$0.06/kWh adder to the system's production over the 20-year tariff term. We calculate the costs on a net present value basis applying a 7% discount rate, reflecting the discount rate used by National Grid for similar analyses. We present the costs on a unitized, per kW basis.

20. What types of carport project benefits was the consulting team able to quantify?

The Consulting Team quantified power system benefits including expected reductions in interconnection costs. We also quantified societal benefits resulting from the preservation of open space, including carbon sequestration, ecosystem services, and preserving property values.

21. Are these benefits appropriate to include in the cost-benefit analysis, based on Docket 4600 Guidance?

Yes. The Guidance Document under Docket 4600 includes not only power system level costs and benefits but societal level costs and benefits, including criteria air pollutant and other environmental externality costs, conservation and community benefits and non-energy costs/benefits: economic development. The quantified carbon sink and sequestration benefits fit within the conservation and community benefits category. The value of ecosystem services fit within the conservation and community benefits and criteria air pollutant and other environmental externality costs. The preservation of property values fits within conservation and community benefits and economic development categories. Benefits in these categories will accrue directly to National Grid ratepayers that bear the costs of the carport adder.

22. How did the consulting team measure the interconnection cost savings of carport projects?

SEA received interconnection costs for all projects selected through REG open enrollments since the 2019 second open enrollment and interconnection costs for all carport projects currently in the interconnection queue, regardless of REG participation. We analyzed interconnection cost savings by comparing the interconnection costs of the carports selected through REG with the non-carport projects selected. We compare the costs on a per kW weighted average basis. The weighted average interconnection cost for the three carport projects selected under the pilot was $60.74/kW. The weighted average interconnection cost for all other projects selected under the same open enrollments was $212.41/kW, resulting in a difference of $151.68/kW. We use this value in the “high benefits” scenario of the cost-benefit analysis.

Given that the comparison described above only includes three carport projects, we also compared the average interconnection costs of the full set of carport projects in the queue with the full set of non-carport projects provided in the data request. We note that the non-carport projects in the data set consist only of REG-selected projects, while the full set of carport projects includes projects that may not participate in REG and may not reach commercial operation. Although the carport and non-carport data sets are not fully equivalent, we make the comparison in order to test the sensitivity of the difference in interconnection cost when a larger, more diverse set of carport projects is considered. Under this second analysis, we find the average weighted interconnection cost of carport projects to be $35.43/kW, and the average weighted interconnection cost of all non-carport projects selected under REG in the past four open enrollments to be $184.91/kW. The difference is $149.49/kW. We use this value in the “low benefits” scenario of the cost-benefit analysis.

23. How did the Consulting Team apply the benefits related to preserving open space in its analysis?

The benefit cost analysis considers the options that policy makers have under the REG program to support distributed renewable energy development in Rhode Island. It compares the costs and benefits of incentivizing a carport project rather than a greenfield project. In a program with limited capacity allocation, the selection of a carport project would utilize program capacity that would otherwise be awarded to the next lowest cost project meeting program criteria. For the Large Solar class, we assume that the lowest cost projects will be greenfield ground mount projects, based on past program awards. The analysis therefore estimates the value of avoiding that greenfield solar development based on the carbon sequestration, ecosystem services and property values the undeveloped open space provides. The historic awards for the Commercial Solar class have included a mix of rooftop and ground mount projects. We therefore weigh the land use benefits of an avoided Commercial Solar class project by the historic proportion of ground mount projects awarded in that category.

24. How did the Consulting Team measure the greenhouse gas emission-related benefits?

The Consulting Team collaborated with National Grid on identifying carbon emission-related benefits resulting from the carport adder, and ultimately adopted the quantification approach identified by the utility. We utilize estimates of the amount of carbon stored in an acre of forest land and the annual carbon uptake of an acre of forest land from the Rhode Island Value of Forests study. We apply a value of the acres of forest cleared per greenfield project based on responses to a survey to developers conducted by National Grid. We then estimate how many tons of carbon continue to be stored and taken up every year by land that would be cleared for a hypothetical greenfield solar project that may be selected and developed if not for a carport award under the REG program. We convert the tons of carbon stored into a dollar value using the social cost of carbon identified in the 2018 Avoided Energy Supply Components in New England report.

25. How did the consulting team measure ecosystem services benefits?

The Consulting Team collaborated with National Grid on identifying the quantitative value of additional benefits of preserving land. SEA and National Grid each conducted research to estimate the value of ecosystem services of land in Rhode Island and neither company was able to find studies specific to Rhode Island. National Grid identified a study regarding the preservation of land in southeastern Pennsylvania that quantified the value of water supply, water quality, flood and storm damage mitigation, wildlife habitat and air pollution removal provided by conserved open land. The Pennsylvania study estimated the total of these value streams at $653/acre. Though the characteristics of conservation land, and the alternative uses of the land if it were to be developed likely differ in southeastern Pennsylvania than in Rhode Island, we find it reasonable to believe that land in Rhode Island provides a similar suite of benefits. In the case that the magnitude of the impact of ecosystem services varies based on the type of land and the alternative development use, we conservatively estimate a low benefits case equal to half of the per acre value of ecosystem services quantified by the Pennsylvania study.

26. How did the consulting team measure property value benefits?

The Consulting Team used the results of research conducted by the University of Rhode Island Cooperative Extension to estimate the impact of a greenfield solar project on the property values of nearby homes. Study authors Vasundhara Gaur and Corey Lang estimated that the property values of homes located within 1 mile of a greenfield solar project decreased by 1.7% following the construction of the project. We apply the 1.7% reduction to the median assessed value ($305,684) of properties in the study's dataset to estimate the per-property loss in value ($5,197). We then apply that reduction to the median number of properties within one mile of a greenfield solar site in the dataset (317) to estimate a total reduction in property values of $1,647,333 per greenfield solar project.

The study examined impacts to properties near solar projects that were at least 1 MW. The impacts resulting from projects in the Commercial Solar class, therefore, are not quantified in the study. However, the research indicated that the impact to property values did not vary materially with project size. The study also found that the impacts to property value were not statistically significant in rural areas. Given the limitations of the research findings for estimating impacts specific to potential greenfield projects under the REG program, we estimate the property value benefits as a range. We assume the impacts found by Gaur and Lang represent the high end of the range for both Commercial Solar and Large Solar. We estimate the low end of the range for Large Solar by applying a 50% scalar to the magnitude of the avoided per-property value loss. As the study does not provide data for projects under 1 MW, we estimate the low end of the range for the Commercial Scale using the same 50% scalar for the magnitude of the per-property impact, as well as a 50% scalar to the number of properties impacted by the Commercial scale project.

27. What are the uncertainties involved in quantifying the Carport Adder costs and benefits?

There are several uncertainties in the quantitative cost-benefit analysis. First, there is only a very small data set of carport projects that participated in the 2020 Carport Adder pilot. Second, to estimate the benefits of constructing a carport project rather than a greenfield ground mount project, we must make assumptions regarding the characteristics of the avoided project. Third, there are very limited data regarding the quantified benefits of preserved greenspace and particularly data that are specific to Rhode Island. Fourth, there is little research that quantifies how solar development impacts individuals and communities, and, what the differences in impacts between carport projects and greenfield projects may be. We utilize the URI research on property value impacts as one of few studies that has quantified an impact, but note that the study is not a perfect fit for this application because it has more data points in Massachusetts than Rhode Island, only includes projects over 1 MW and does not measure the impacts to properties near rooftop or carport projects.

28. How did the consulting team handle those uncertainties?

Given the uncertainties inherent to the analysis and the imperfections of the data available, we estimated the benefits of the carport adder as a range. We define the values of ecosystem services and property values provided in the research as the high end of the possible benefit scale. As a practical matter, the uncertainties could go in either direction. For this analysis, to be conservative, we reduce the magnitude of benefits in a low case, rather than increase them in a high case.

29. Did the consulting team identify other benefits of carports that it was not able to quantify?

Yes. Additional potential benefits may be realized at both the power system level and societal level. With respect to potential power system benefits, because carport projects have less costly interconnection capital costs and are less likely to require extensive system upgrades, they are also likely to incur lower ongoing operational expenses over the system life. At the time we conducted the analysis, National Grid had not estimated these costs on a per-project basis and therefore it was not possible to quantify the difference between carport projects and other solar projects. Societal level benefits include the preferences of the host community, which our interviews suggests will favor carport projects to ground mount projects for environmental and aesthetic reasons, and preferences of individuals outside of the host community who may place moral, environmental, recreational and/or aesthetic value on the preservation of open land. Quantification of these benefits will require additional study. Finally, there are private benefits that may accrue to a solar carport host or its customers that may or may not be captured in a site lease or project agreement, such as sheltered parking from the elements and the publicity benefits of visible sustainability actions such as on-site solar. We did not quantify such benefits because there is little data on their magnitude. It is not clear when they are internalized in a site agreement and they may vary based on the design of the carport project.

As there are likely to be additional benefits to carport projects that have not been quantified in our analysis, we reason that the quantitative cost-benefit analysis provided herein represents a conservative estimate of the total potential net benefit of the carport adder.

30. What discount rate did the consulting team use in the cost-benefit analysis?

In coordination with National Grid, we used a 7% discount rate. The rate is based on National Grid's cost of capital and represents the utility's time value of money or opportunity costs for making an alternative investment. National Grid has used the same rate in other cost-benefit analyses, in particular, its analyses for the other proposed REG public policy adders.

31. What are the total net benefits of the Carport Adder?

We quantify the value of the total net benefits of the Carport Adder as a range, reflecting the uncertainty of defining specific and precise impacts of a carport project itself and the other projects not selected under the REG program because of the selected carport. For the Commercial Solar class, the net present value (NPV) of the total net benefits (total benefits less total costs) range from (-$148/kW) to $1,433/kW, resulting in a benefit-cost ratio range of 0.81 to 3.04. For the Large Solar class, the NPV of net benefits range from (-$403/kW) to (-$82/kW), or benefit-cost ratios ranging from 0.49 to 0.88.

32. How do the net benefits vary under different discount rate assumptions?

In addition to using National Grid's cost of capital, we run the analysis assuming a lower discount rate. Discount rates of 2-3% are commonly used in cost-benefit analyses of public policies that produce public benefits over the long term. We do not use this lower discount in the main cost-benefit analysis because it is appropriate to evaluate the expenditures and returns on the carport adder in comparison to National Grid's alternative investment choices, which are reflected in a discount rate approximating the utility's cost of capital. In a sensitivity run of the analysis at a 2.5% discount rate, the NPV of the Commercial Solar class net benefits range from (-$505/kW) to $1,123/kW, or a benefit-cost ratio range of 0.56 to 2.09. The Large Solar class NPV net benefits are (-$755/kW) to (-$385/kW), and the benefit-cost ratios are 0.34 to 0.63. The net benefits are lower with a lower discount rate because the Carport Adder costs occur almost evenly over the 20-year tariff and are therefore discounted, while a greater proportion of the benefits occur in Year 0 and are not discounted.

33. What is the consulting team's recommendation regarding a carport adder for the 2021 REG program year?
The Consulting Team recommends continuing the Carport Adder Pilot for an additional year in order to collect more data on carport projects that apply and award under the project to better understand bidding behavior with and without the Carport Adder and to provide the opportunity to refine and improve the benefit-cost analysis.

34. Why is it necessary to continue the pilot to obtain additional information?
While the Consulting Team was able to gather useful and informative data regarding the costs and other characteristics of carport projects, data from projects actually participating under the REG program are quite limited, given the small number of projects that applied under 2020 open enrollments. The competitive bidding requirements of the REG program have different implications for project economics than participating in net metering or in another state program, such as the SMART program in Massachusetts. One interesting observation from the 2020 pilot is that half of the carport projects participating bid well under the ceiling prices for their relevant classes, while the other half bid at or close to the ceiling price. If enough data points are available, bidding behavior can reflect how well the ceiling prices (and adders) align with the market and segment-wide economics. Additional data points are necessary to be able to draw any conclusions regarding the market response from the carport adder as reflected in REG bids.

Another year of the pilot will provide not only an opportunity to increase the sample size of carports included in the analysis, but also will provide a longer time period over which to consider the impacts of the pilot. The carport projects participating in the 2020 pilot are still in early stages of development and an additional year will provide more information about how the projects move through the permitting and construction process. Because development timeframes can be long, another year of the program may also reveal whether the market responds to the carport adder by proposing more carport projects or shifting development focus away from greenfield ground mount projects.

35. What follow-up analyses do you believe are appropriate for the continued review of the Carport Solar pilot program?
At the August 13, 2020 technical session, SEA discussed with the Commissioners and staff developing a baseline for the degree to which open space is preserved in the absence of a carport adder. We considered approaches for how we may measure such a baseline and the change from the baseline. Upon such further consideration, we believe that defining a baseline scenario based on development choices made outside of the REG program would be both very difficult/resource intensive and not a useful approach to considering the policy options under the REG program. However, an additional year of the carport pilot would allow us to research whether the focus of solar developers active in Rhode Island has, or is likely to, shift in response to the carport adder by asking developers if their pursuit of greenfield projects has changed with a smaller capacity allocation available to non-carport projects.

36. What is National Grid's carport adder proposal for the 2021 Program Year?
National Grid has proposed to continue the Carport Adder pilot at a level of 5 cents per kWh. This adder level is in line with SEA's modeling of the most-cost effective carport projects based on open enrollment and survey cost and production data.

37. What are the estimated total net benefits of the Carport Adder at the 2021 proposed level?

The 5.0 cent adder proposal for 2021 results in reduced costs for the REG Carport Adder program. Under a 5.0 cent adder, we estimate the NPV of net benefits for the Commercial Solar category as a range from (-$18/kW) to $1,550/kW. The corresponding benefit-cost ratio range is 0.97 to 3.64. For Large Solar, the NPV of net benefits ranges from (-$273/kW) to $35/kW, reflecting benefit-cost ratios of 0.58 to 1.06.

38. Please interpret the results of the cost-benefit analysis. Do the negative net benefit results mean the carport adder does not produce benefits to ratepayers?

No. The NPV of total net benefits is derived from total benefits minus total costs. Where the costs of the adder scenario are greater than the quantified benefits, the net benefits are negative, and the benefit-cost ratio is less than one. Even when the net benefits are negative, however, the carport adder produces benefits for Rhode Island ratepayers. We present a range of benefit-cost assumptions because actual costs and benefits resulting from a project receiving the carport adder will vary based on several factors. The range of results from our analysis indicates there are several scenarios under which the benefits of awarding a carport project over a non-carport project outweigh the costs of doing so. The results of the quantified cost-benefit analysis also do not include non-quantified benefits described in Question 29, and therefore reflect a conservative estimate of the total benefits. National Grid’s proposed 5.0 cent adder increases the likelihood that the benefits of the carport adder meet or exceed costs, as our analysis estimates that the quantified benefits approach or exceed the adder costs in most of the scenarios evaluated (see Table 18 of the Carport Evaluation Report).

39. Does this conclude your testimony?

Yes.

KD Schedule 1 – 2020 Program Year Carport Solar Pilot Program Evaluation Report

See file named:

1. *KD Schedule 1 - CONFIDENTIAL 2020_REG_Carport_Pilot_Evaluation_Report.docx*
2. *KD Schedule 1 - REDACTED 2020_REG_Carport_Pilot_Evaluation_Report.docx*

KD Schedule 2 – SEA Presentation at August 13, 2020 Technical Meeting (Docket 4604)

See file named: KD Schedule 2 - OER & DG Board PUC Technical Meeting Presentation_FINAL (As Filed)